PAPER TRADE
JOURNAL
April 2, 1954

- *What can be done about machine noise*
- *Today's Hardboard Industry— A Survey of Its Rapid Growth*

WOOD PULP

G

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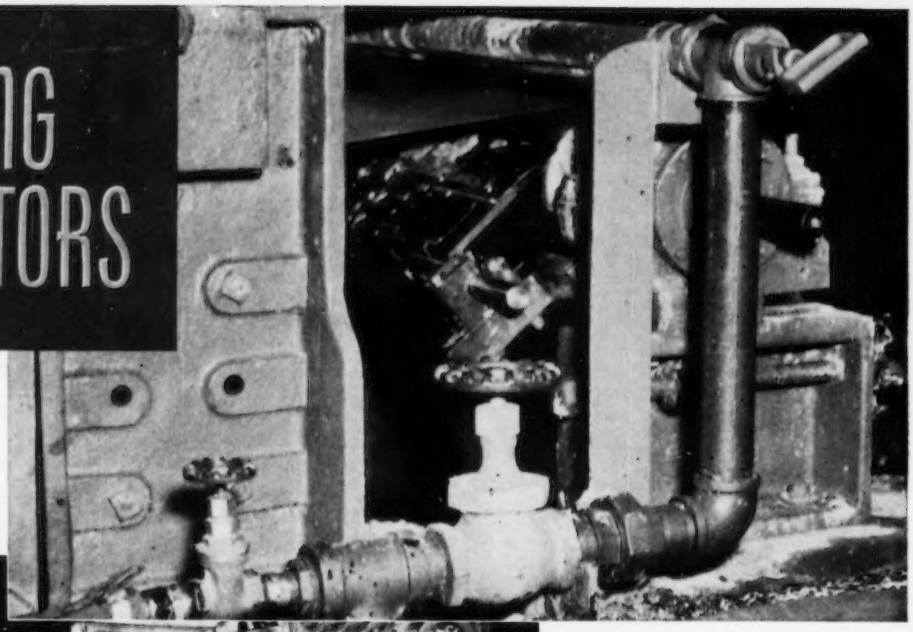
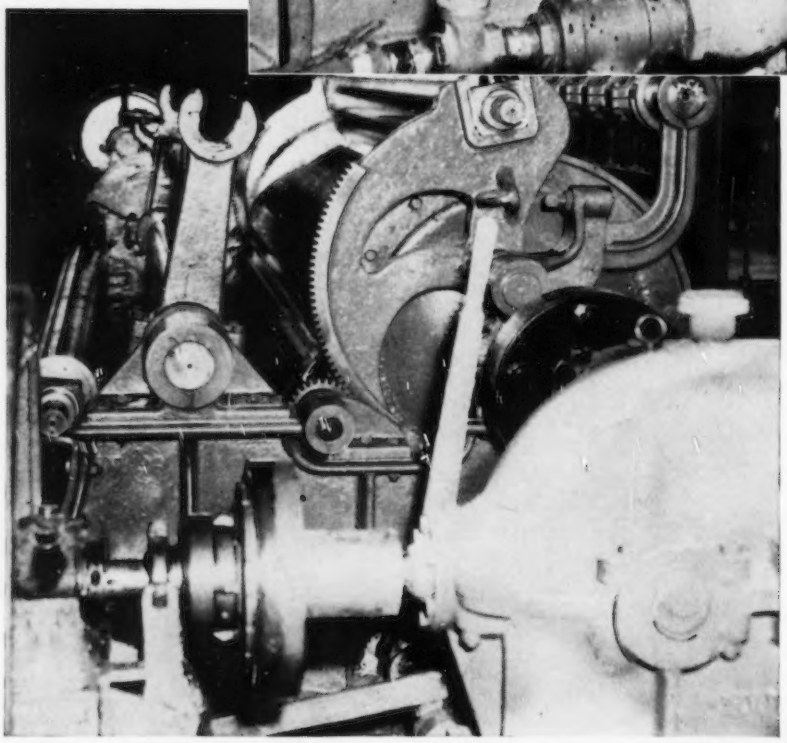
LODDING DOCTORS





From Fourdrinier to Reel— wherever doctors are needed —the paper industry relies on LODDING engineering.

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think first of the coatings that last!

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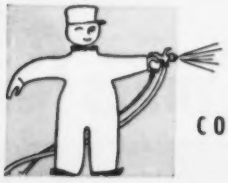

Insul-Mastic

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Representatives in Principal Cities

"I ought to have my head examined!"

I just made a 1200 dollar mistake. A mistake that could have been averted by a simple telephone call.

I've specified tubing for a lot of installations, and frankly, I've done a pretty fair job. But this job was different—a set of conditions I'd never run up against before.

Well, I specified a good alloy tubing that I knew definitely would do the job. Sorry to say I didn't consult National Tube's engineers—just put through the purchase order for the tubing.

When the job was finished, I was pretty proud of it. I wanted to crow a little bit, I guess, so I invited a National Tube expert over to see how well we had put his product to use.

After looking it over carefully, he asked a few questions, then said, "I wish you had called us before you bought, Mr. Brown. We could have saved you about 1200 dollars."

I could have kicked myself. It seems that the analysis I selected was close, but not exactly right. To be on the safe side, I had specified a higher grade tubing analysis than the installation required—spent 1200 dollars more than necessary.

The worst part of it is that I knew I could have called in a National Tube engineer beforehand. He would have surveyed the job and recommended the *right* analysis because he's come in contact with just about every tubing problem in the book. And his recommendations wouldn't have cost me a cent. Oh well, live and learn. But the next time, I'm calling in National Tube *before* I buy.

WALLS WITHOUT WELDS

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(Tubing Specialties)

COLUMBIA-GENEVA STEEL DIVISION, SAN FRANCISCO, PACIFIC COAST DISTRIBUTORS
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U·S·S NATIONAL *Seamless* PIPE AND TUBES

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UNITED STATES STEEL

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Published every Friday by LOCKWOOD TRADE JOURNAL CO., INC., 15 West Forty-Seventh Street, New York 36. Phone: PLAZA 7-2370.

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Entered as Second Class Matter at the post office at East Stroudsburg, Pa., under Act of Congress of March 3, 1879. Publication Office at Lockwood Trade Journal Co., Inc., 34 North Crystal St., East Stroudsburg, Pa. Printed in U.S.A.

Copyright 1954 by Lockwood Trade Journal Co., Inc.

Paper established Feb. 17, 1899, combined with *Paper Trade Journal* Nov. 16, 1899. *Paper* established Sept. 21, 1910, combined with *Paper Trade Journal* February 19, 1926.

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Paper Trade Journal is indexed in Industrial Arts Index and Engineering Index. Also publisher of Lockwood's Annual *Directory of the Paper and Allied Trades.*

REMEMBER THESE DATES

MAY 20-22: Joint Spring Meeting, Pacific Section, TAPPI, Pacific Coast Div., APPMSA, Gearhart Hotel, Gearhart, Oregon.

MAY 23-25: Spring Meeting, National Paperboard Assn., Grove Park Inn, Asheville, N. C.

MAY 24-26: TAPPI Coating Conference, Poland Spring House, Poland Springs, Maine.

JUNE 10-12: Annual Meeting TAPPI Empire State, Whiteface Inn, Saranac Lake, N. Y.

JUNE 14-17: Summer Meeting, Technical Section C.P.P.A., Empress Hotel, Victoria, B.C., Canada.

JUNE 21-23: National Meeting American Pulp and Paper Mill Superintendents Assn., Sheraton-Mount Royal Hotel, Montreal, Que.

PAPER TRADE JOURNAL

Published Weekly Since 1872

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LOCKWOOD TRADE JOURNAL CO., INC., 15 W. Forty-Seventh St., N.Y. 36

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GEORGE E. LOCKWOOD, President and Treasurer — ARTHUR E. GORDON, Vice-President — FREDERICK E. WINKLER, Secretary

. . . there are several starting points for its many uses and users

"What shall we use?" This question always confronts management when it is considering raw materials to be used in operating processes, and is not always easy to decide.

In the manufacture of sulphuric acid, the use of sulphur in some form is mandatory, whether it be elemental sulphur or sulphur in combination with other elements. No single factor can determine which raw material should be used. Relative supply situation, cost of transportation, cost of plant and cost of use are all considered by management.

For three decades elemental sulphur as a raw material has had first choice as a solution of the problem, "What shall we use?"

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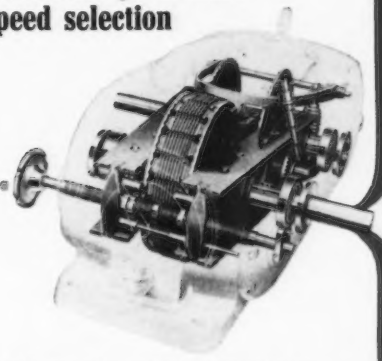

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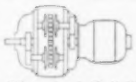
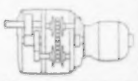
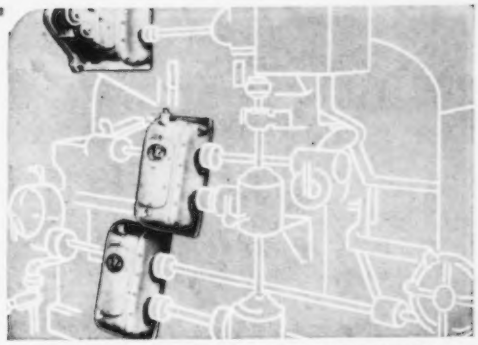


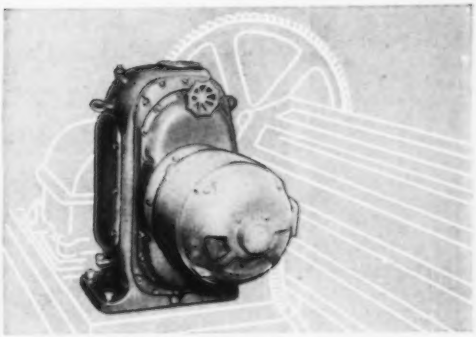
Motorized P.I.V. with single reduction input and output helical gears.



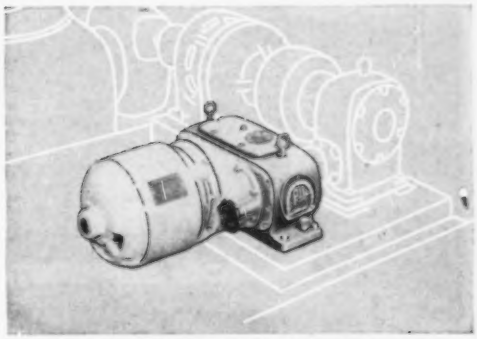
Motorized P.I.V. with single reduction input and double reduction output helical gears.



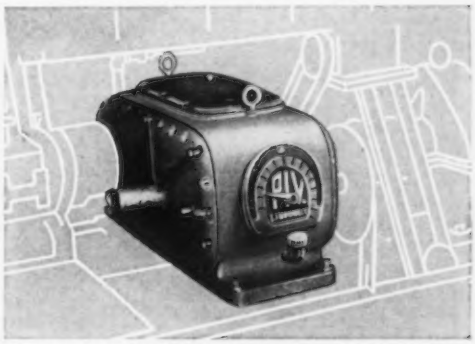
POSITIVE OPERATION OF DIFFERENTIAL SPEED EQUIPMENT. P.I.V. also provides precise regulation of rotary motion.



FLEXIBILITY IN TIMING. In addition, P.I.V. offers accurate control of processing speeds, unaffected by atmospheric conditions.



STEPLESS CONTROL OF PRODUCTION LINES OR INDIVIDUAL MACHINES, either manually or automatically, positively, dependably.



EXACT SYNCHRONIZATION OF ROTATING PARTS AND MACHINES. P.I.V. is needed where automatic sequence control must be stepless.

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ROTARY KILNS
FOR REBURNING LIME SLUDGE

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"Chained Heat"

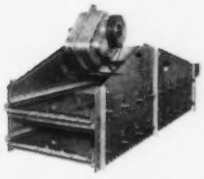
Patented Heat Recuperating System Cuts Fuel Requirements 40%

LOW FUEL CONSUMPTION in Allis-Chalmers kilns is made possible by a chain-hanger spiral arrangement. In this system, heat transferring chains dip alternately into the slurry. Heat transfer surface is increased, and the drying heat extracted from kiln gases is transferred to the wet slurry. The effectiveness of this system is reflected in the fact that the Btu requirements drop 30 to 40% in chain equipped kilns. Efficient use of heat also increases kiln capacity as much as 10%.

LIME SLUDGE RECOVERY is an important economy in operating a sulphate paper plant. Just how big a cost cutting part is played depends upon the equipment used in reburning the lime. In an Allis-Chalmers kiln, a ton of lime can be reburned for approximately *half the cost* of new lime.

For more information about kilns, see your local A-C representative, or write for Bulletin 07R7010, Allis-Chalmers, Milwaukee 1, Wisconsin. A4271

Allis-Chalmers Offers a Choice of Chip Screens



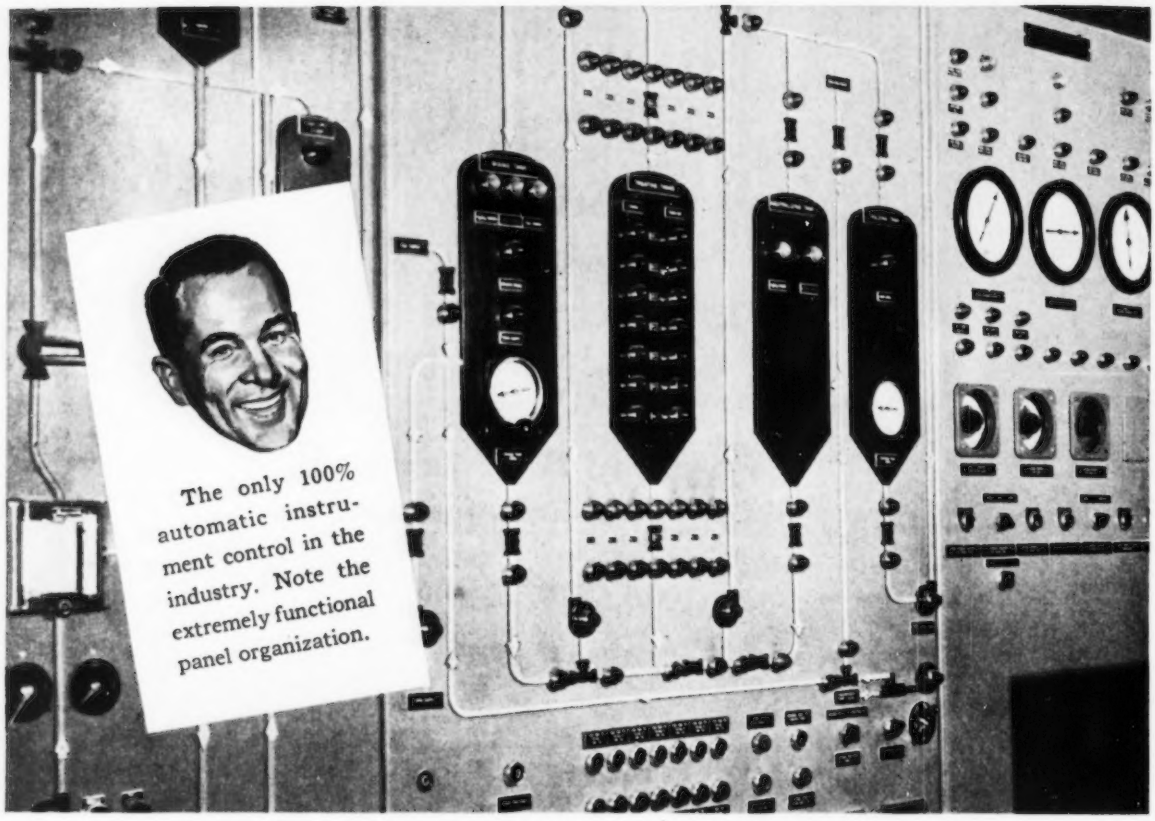
Low overall design, with screen on a horizontal plane, makes the *Low-Head* screen ideal for limited head room space. Completely sealed mechanism cuts maintenance, makes servicing easy.

With screen inclined 25 degrees, the *Ripl-Flo* screen conserves floor space. If low initial cost is a determining factor, the *Ripl-Flo* screen should be your prime consideration.

Field tests prove *Low-Head* and *Ripl-Flo* screens will have the same capacity under similar conditions. Space requirements, initial cost and maintenance are some of the factors in selecting a screen. See your local A-C representative for help in selecting the best screen for your operations.

ALLIS-CHALMERS

Low-Head and Ripl-Flo are Allis-Chalmers trademarks.



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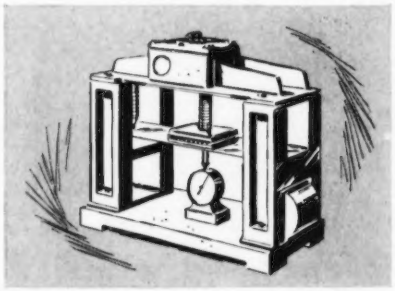

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TRENDS

PAPER TRADE JOURNAL

Paper and Board Buyers Cautious and Price-Conscious

Paper and board buyers are not the natural prey of recession propagandists; neither are the producers; business is just too good.

They have of course heard a lot of fearful forecasts which they are disposed to discount as "political ballyhoo." But they are all buying with extreme caution, paring inventories to a respectable minimum; and they are extremely price- and cost-conscious.

On the whole, industry executives do not look for stormy weather ahead, but they are prepared should it come.

Warn Against Over-caution. Paper distributors, mill executives, pulp and chemical suppliers savor in the current business atmosphere elements which could develop an upswing, just as it did in pre-Korean 1950.

At the risk of being accused of self-interest only, industry men and suppliers are sounding a warning that their customers do not grow so cautious that they trim inventories to the point where a dock strike or other emergency could embarrass their operations.

Already imports of rags, bagging, casein, newsprint and other commodities which dock at New York are either rerouted, lost in the maze, or cut off completely. Should the strike be extended, imports of wood pulp — which usually come in at Newark, Baltimore, and other Atlantic ports — would be imperilled at a time when mill stocks are not overlarge.

Chiseling Competition Shows Up in Paper and Board

Evidences of lighter mill backlogs and of the anxiety of marginal operators to keep rolling are more marked as supply-demand factors operate. Spotty price nibbling is reported in many types of paper and paperboard. We have heard of no "price weakness," except perhaps in plain chip and newsboard.

This Is Not News. Though featured in the business press, there is nothing about the current situation which could be called *news* except its timing. As in other periods of adjustment, the small plants which mushroomed on the heels of a boom are trying to stay in operation. New producers sprang into existence during the Korean boom for the quick dollar, often as an investment or as a hobby. Using out-of-date equipment and plants, they have been marketing jute corrugated, liners and cartons; chip and news boards; tissues, multiwalls, bags, etc.

Now that the boom has faded, they are attempting to hold onto a portion of the market by price discounts instead of quality. Ultimately, they may put their plants in mothballs till the next economic upswing.

In the best industry opinion, this is not price weakness but competition chiseling at published prices; and it is a component of any adjustment period.

Discount Chiseling in Tissues, Towels and Book

Paper men say that Five Percenters are part of the normal paper market, and since there are five percenters and plus fives in today's operations, the market must be considered normally competitive.

In toilet tissue and towels, the open season for school business prevails from now until late June. Leading mills report this year's demand level excellent. They plan for steady gains.

Marginal producers and the small mills which show stiff competition for school, institution and government business are now chiseling away at prices to the point where they can barely break even, industry sources state.

Though no general price cuts are expected, their discount system does slash away at list prices on school and government bids. This is not price weakness; the market is strong at firm prices for leading brands.

Liner Board Cut By West Coast Mills

The extremely competitive west coast fiber-box market reacted to out-of-state competition earlier this month by dropping the price of kraft liner $5 a ton. Now priced at last Fall's level of $117.50 by Pacific mills, 42-lb kraft liner is reported firm at unchanged levels in all other markets. Southern mills producing on a national scale anticipate no price change for either liner or corrugated, their representatives state.

Chip Is More Stable. Whether an actual pickup in chip and *news* boards business is involved in the recoup of paperboard production to 92 percent is not reported. It does appear that prices in principal Atlantic cities are less confused, and that the special discount pricing has been lessened. Delivered prices for chip are posted at $85 for New York, though $70 and $75 levels also are reported.

Rescind 3% Rise on Multiwall Sacks

Late 1953 prices now prevail for multiwall sacks. The 3 percent advance of January 1 was withdrawn about March 10 on a competitive market. No factor of price weakness involved, well-informed sources say. Demand this year is equal to the peak record set in 1953, and the outlook is for steady gains.

Because the January rise resulted from a $5 advance in cost of unbleached kraft paper, its withdrawal poses a question about the price of sack paper. Paper producers report demand good, mills operating well, and an otherwise firm market.

Paper Cup Usage Widening in Hospitals

Seventy percent of American hospitals are now using some paper cups in the serving of food or for dispensing medicine, according to a nation-wide survey conducted by the Field Research Division, Paper Cup and Container Institute, Inc.

Fastest growing feature on the hospital food scene is the hospitality shop with 57 percent using paper cups for food service. In addition to their use of paper cups and containers for general patient feeding and for staff and employee meals, 70 of the reporting dietitians said they used paper cups for special or modified diets; 48 percent for nourishment service; and many employed them for isolation cases.

Growth of use of paper cups for dispensing medicines is ascribed to their value in saving high-cost nursing time. "Economy and efficiency of operation" were given by 155 of the 238 dietitians for the use of paper; 96 emphasized sanitation. In one hospital which conducted an exhaustive two-month test of all paper service, patient reaction showed that 646 out of 650 private and ward patients approved of its use.

Overall results indicated that the use of paper cups and containers by hospitals is growing, with 60 percent of respondents reporting more paper items used and more applications since World War II. —E.P.N.

Paperboard Production (Tons)*

	Mar. 20 1954	Mar. 13 1954	Mar. 21 1953
Production	245,325	243,388	247,375
New Orders	211,110	253,105	207,239
Unfilled Orders	375,158	410,285	476,361
% of Activity	92	91	95

* Source: National Paperboard Assn.

"U. S." Roll Coverings are looked up to for quality performance

THE quality performance of "U. S." Roll Coverings is the result of plenty of study and research. United States Rubber Company engineers analyze operating conditions, check operating speeds, working pressures, types of stock—to make sure you get the exact covering for the job.

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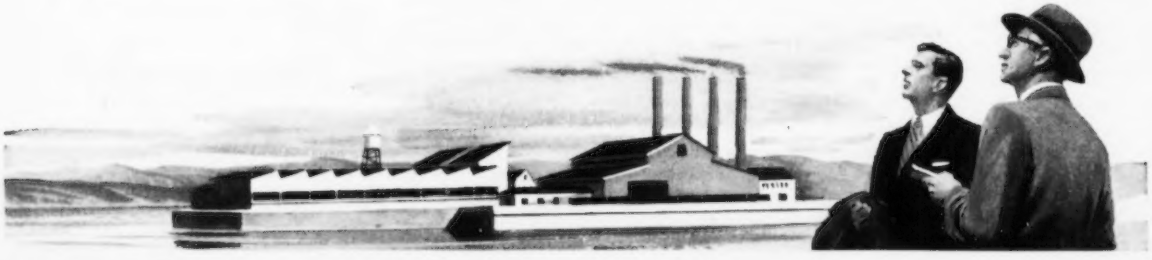

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If you are not already profiting from Du Pont's long experience with pigments, now is the time to talk with your Du Pont representative. He will be glad to show you how Du Pont's new direct service can help you with your pigmenting problems. E. I. du Pont de Nemours & Co. (Inc.), Wilmington 98, Del.

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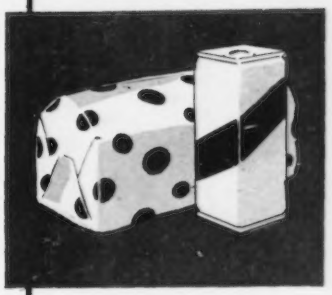
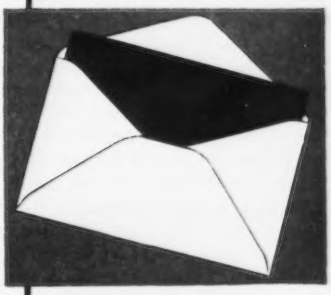


FOR WHITENESS

"Ti-Pure" gives your paper a whiteness—that lasts! Ideal for a variety of food wrappers and containers, particularly waxed bread wraps and waxed boards.

FOR BRIGHTNESS

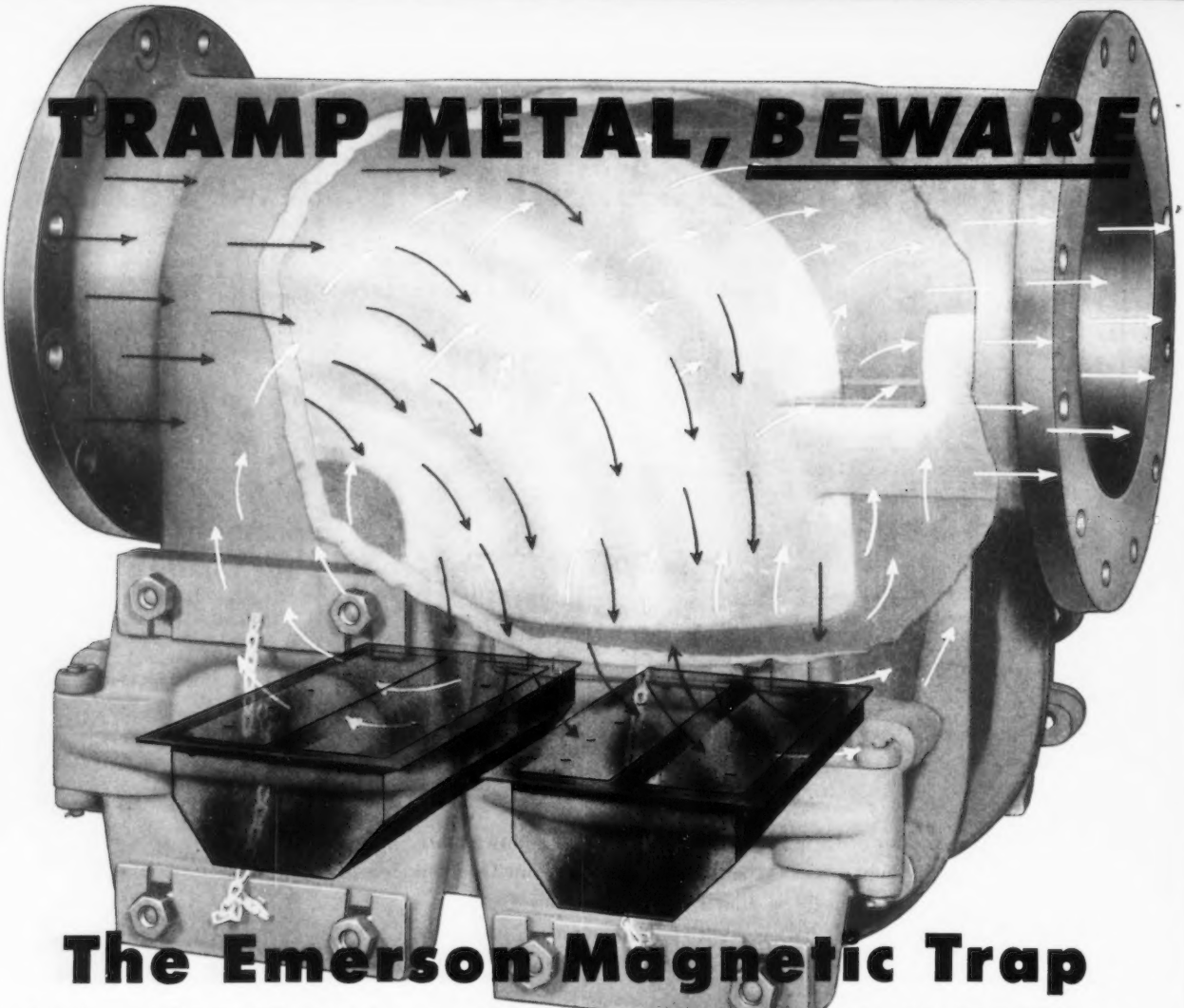
"Ti-Pure" permits sharper reproduction of printed matter. Both black-and-white and color work stand out better on book stock, stationery and magazine paper.



FOR OPACITY

"Ti-Pure" eliminates show-through—especially important in lighter-weight papers for envelope stock, stationery and waxed board. Saves user money on mailing costs.

TRAMP METAL, BEWARE



The Emerson Magnetic Trap

The Emerson Magnetic Trap introduces a new idea for separating junk material from paper pulp and other liquid flow lines — particularly where conditions of high stock velocity and consistency exist. Combining the principle of the trap with that of magnetic separation, the removal of both magnetic and non-magnetic material is accomplished. You no longer need to fear the danger of tramp metal damaging expensive machinery or equipment.

Engineered for Efficiency — Stock is directed to the plates at right angles. As the square-inch area of the plates is over four times that of the pipe, stock remains over the plates more than four times longer — well within the flux pattern of the magnets — with no restriction to normal pipe line flow. A rush of stock from inlet to outlet is prevented by a baffle. Stock leaves the plates vertically — slowly — relieved of all junk material.

Greater Magnetic Power — Emerson Heavy Duty Magnetic Plates — carrying a 10-year pulling power guarantee — were specially designed for this unit. Magnets are cast of the new super strength Hyflux Alnico V with 22% more magnetic strength — completely enclosed in stainless steel non-magnetic housing.

Easy to Clean — One complete turn of the nuts frees the gibs and the hinged doors are free to open. Plates can be cleaned inside the housing or removed.

Easy to Install — Emerson Magnetic Traps are equipped with Standard Class 125 C.I. pipe flanges for connection on 8", 10", 12" or 16" pipe lines.

Send for Catalog 1044-M for information on:

Emerson Magnetic Traps — for difficult conditions of separation.

Emerson Magnetic Separators — for moderate conditions of separation — stocked in 6", 8", 10", 12" and 14" pipe sizes.

Emerson Magnetic Plates — for separate installations in troughs, pipes, chutes, flow boxes, head boxes, etc.

The Emerson Manufacturing Co.

Division of John W. BOLTON & Sons, Inc.
Lawrence, Massachusetts, U.S.A.

Million Dollar Addition To Rayonier's Port Angeles Mill Nears Completion

A million-dollar addition to the woodmill at the Rayonier Incorporated plant at Port Angeles, Wash., is well underway, and should be in operation by midsummer, according to Resident Manager Harry A. Thurlow.

It will include a new bridge crane to remove logs from the pond, a new building housing an additional hydraulic log barker, a new log chipper and a new chip bin.

Mr. Thurlow said the crane will be of sufficient capacity to lift a railroad carload of logs onto an elevated log deck, from which they will be fed into the mill to the new barker.

The barker will be a recently developed type, known as a Hansel Ring Barker. Logs up to 36 inches in diameter will pass through it endwise, receiving the force of three jets of water at 1,400 pounds per square inch, which effectively removes the bark. A 1,000 hp. pump will deliver 900 gallons per minute for the operation.

A new two-story steel building 95 x 60 feet will house the barker and necessary other equipment.

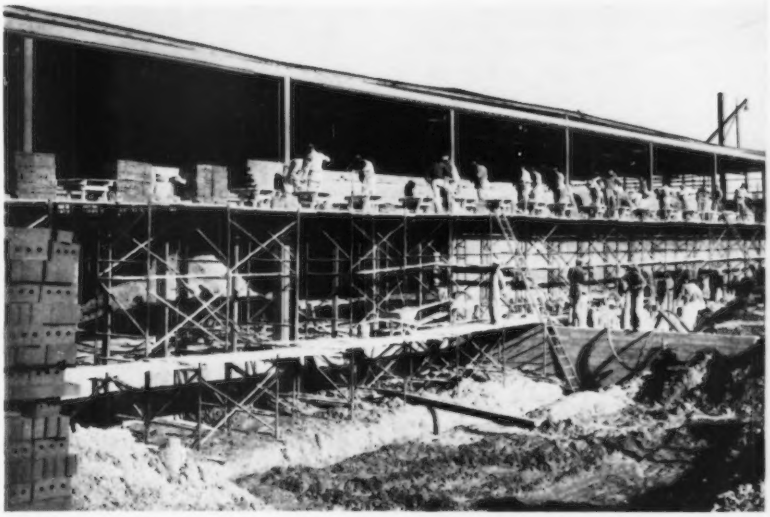
The addition also will include a new log chipper with a 12 foot 6 inch disc capable of reducing a 36-inch diameter, 24-foot log into small chips in 14 seconds. It will be powered by a 1,750 hp. electric motor.

These new facilities will effect a substantial savings in the amount of wood now being used to make chips at the mill, Mr. Thurlow explained. They will eliminate the necessity of sawing logs into smaller cants for feeding into the present small chippers, and the additional hydraulic barker will save wood now lost through mechanical bark removal processes.

In addition to reducing wood costs, these savings will materially extend the timber resources available to Rayonier mills.

New Paper Mill for Iraq

According to *Commerce Weekly*, the Iraqi Government reportedly has plans for developing a paper industry. Products to be made include newsprint, wrapping paper, and paperboard.



BRICK BY BRICK, the construction of Union Bag & Paper Corp.'s new combined warehouse and specialty bag department building is nearing completion. Switching of specialty equipment is expected to begin May 1. The 1269- x 290-foot structure has an insulated steel decked roof and a ventilating system that will change the air 20 times an hour. Portion of the roof over the manufacturing section will be topped with chips of Georgia white marble to provide heat reflection.

Construction Started on Weyerhaeuser's New Board Machine Bldg.

Construction has started on the previously announced new paperboard machine building at the Longview pulp division of the Weyerhaeuser Timber Co. The 65 x 480-foot structure will be erected on the west side of the existing machine building.

L. H. Hoffman, 715 S.W. Columbia street, Portland, Ore., has the general construction contract for the project. Mr. Hoffman is prefabricating forms for the building.

Raymond Concrete Pile Co., Portland, is driving 2000 piles for the job. These are wedge type composite piles consisting of a cast-in-place concrete top section and untreated lower section.

R. E. Baker, manager of the Pulp division, said three digesters, a turbine and other allied equipment will be installed. Target date for production in the new building is May of next year.

The machine will produce approximately 200 tons of corrugated paperboard daily. This capacity will double the output of container board at the Longview plant.

The building will occupy property which formerly provided quarters for the Pulp Division's research laboratories and office. A new building for this department is under construction near the Lumber Division Office.

New Waste Disposal Plant In Use at Mac Sim Bar

In an effort to cut pollution in the Kalamazoo River Valley, the Michigan Water Resources Commission set a deadline of June 15, 1955, for mills and cities along the river to install disposal units.

On March 14, well in advance of the deadline, the Mac Sim Bar Paper Co., Otsego, had a complete unit in operation. The unit, consisting of three large tanks and a disposal power plant, treats more than six million barrels of waste water each day.

The unit is an automatic setup and can be operated under the supervision of one person. A. W. Tackaberry, mill engineer, was responsible for installation of the disposal unit and is in charge of its night-and-day operation.

The unit, which covers an area 300 by 60 feet, takes waste solids out of the paper production by-products. State regulations allow only 10 pounds of waste per ton of paper production.

Publishers' New Bleach Plant and Water Filtering System Nearly Complete

More than $500,000 to improve product quality will have been spent in the last 12 months by Publishers' Paper Co. for two major additions to its Oregon City, Ore., plant.

In commenting on the two projects, Vice-President Sam Robinson declared that a new bleach plant is now complete but still undergoing trial runs to remove minor "buts." The water filtering plant is expected to be in full operation sometime in June.

All groundwood will be routed through the bleaching plant, and the bleached pulp will be used in producing a brighter, whiter newsprint. Pulp from this plant also will be used in the mill's specialty products, such as tissues, meat wrap, etc., Mr. Robinson said. Capacity of the bleach plant is rated at 250 tons a day.

The water filtering plant will produce about 15 million gallons a day, believed to be more than sufficient to supply the mill's needs. It is being completed on Water street between 4th and 5th Avenues.

Water will be pumped from the Willamette River when gravity flow will not supply a full head. After filtering, the water will go into underground storage for withdrawal by various parts of the sprawling mill. At present, river water is used after passing through screens to remove debris, but some seasonal silt and dirt go into the paper manufacture, precluding production of as white a sheet of newsprint as is necessary to meet competition.

C-Z's Improvement and Expansion Gets Underway at St. Helens Mill

L. H. Hoffman, 715 S.W. Columbia, Portland, Ore., has started work in connection with the Crown Zellerbach Corp. expansion and improvement project at the firm's St. Helens plant, Ore.

Initial work will include rebuilding machine No. 1, additional digester facilities, expanded chip storage, a new lime kiln, finishing room, and a number of other improvements to the plant.

Last February, J. D. Zellerbach, president of the firm, said about $7 million would be spent to increase pump facilities, modernize the No. 1 machine and other improvements at the plant under the initial phase of work.

The Raymond Concrete Pile Co. will start work early next month on foundation work for chip handling and storage facilities. The firm will use step-taper cast-in-place concrete piles for the project.

Earlier reported plans of Crown Zellerbach call for the installation of a new tissue machine. The 258-inch Yankee machine, now being built at Beloit, Wis., will have a capacity of 35,000 tons a year. It will be capable of producing napkin, facial and toilet paper from bleached kraft pulp. The new machine is expected to cost an additional $7 million.

The complete program is expected to extend over a period of several years. The initial phase, on which work is now underway will take approximately one year to complete.

Chicagoans to Undertake Burma Mill Construction

Construction of a pulp and paper mill utilizing bamboo fiber is expected to get underway next fall near Akyad in northern Burma. The 100-ton per day plant will be built by two Chicago firms: Howard T. Fisher & Assocs., architects; and Robert E. Hattis Consulting Engineers.

Mr. Hattis and J. A. Pruyn of the architectural firm will shortly fly to Burma to make preliminary construction surveys. They will be accompanied by H. R. Murdock of Elmendorf Research, Inc.

The project to be paid completely with Burmese capital, will entail the establishment of an entire town at the mill site and the development of plants to produce caustic soda, lime, sulphuric acid, etc.

Racquette River Completes Mill Improvements

Racquette River Paper Co. recently completed improvements in its pulp and paper mills. These include the remodeling of the company's 96-inch trim (paper) machine with a new headbox, and ultra modern screening and dirt-removal machinery. Material handling has been streamlined with the purchase of electric lift trucks with roll grabs.

Russell C. Shearer, plant manager, has announced that the company now has plans for extensive alterations in stock-preparation.

Sutherland Gets Freedom Foundation Medal

Sutherland Paper Co., along with other manufacturers of paper cups and food containers, has been selected by the Freedoms Foundation at Valley Forge, Pa., to receive its George Washington Gold Medal. A cash award also will be given to the company.

The honor for Sutherland is a result of its contributions to a stockpiling program in which the firm cooperated with Civil Defense and Red Cross authorities to provide a stockpile of 25 million paper cups, dishes and food containers. This was done at the expense of industry members cooperating.

The paper containers have been placed in 20 strategic locations in the United States. Another phase of the project was an educational program by the industry to alert the people to the need for civil preparedness.

Paper and Board Production

According to the American Paper and Pulp Association, the ratio of United States paper production to mill capacity for the week ending March 20, 1954, was 94.2 percent, compared with 93.1 percent revised, for the preceding week. The ratio was 95.2 percent for the corresponding week a year ago. Mills producing newsprint exclusively are not included.

The paperboard production ratio for the week ending March 20, 1954, was 92 percent, compared with 91 percent for the preceding week, and 95 for the corresponding week last year.

(Detailed statistics on page 45.)

Powell River Buys Controlling Interest in Martin Paper Products

Powell River Co., Ltd., Vancouver, B. C., has acquired a controlling interest in Martin Paper Products, Ltd., manufacturer of paper cartons and boxes with plants in Winnipeg, Calgary and Edmonton. Financial details of the purchase were not disclosed. Martin's three plants employ some 250 workers and have a total capacity of 600 million square feet of corrugated board annually. An art department designs and produces labels and printing for its customers and offers consulting service in the development of paperboard containers.

Pulpwood Haulers Operate from Jail Cell

Three pulpwood truckers who refused to pay fines for overloads are running their pulp hauling operations from their cells in the Lincoln County jail at Merrill, Wis.

The truckers ran this ad in the Merrill *Daily Herald:*

"Notice. We are able to take care of our pulp hauling jobs even though we are now in county jail. Visitors welcome. Hours: 2 to 4 and 7 to 8:30."

State traffic officers last month arrested 22 pulpwood haulers for violating the weight laws. The truckers, through the Northern Wisconsin Truckers Assn., argued that they should be permitted to carry heavier loads than the law provides.

Those who chose jail terms rather than pay their fines were John Schmit, 33, and Casey VanRyen, 27, of Tomahawk, and Donald F. McCumber, 45, and Glen Meier, 30, of Ogema.

Mr. Van Ryen completed his 15 day term and was released. Messrs. Schmit and Meier served 30 day terms which ended March 18. They had a choice of the jail terms or fines of $162 each. McCumber chose a 150 day term rather than pay a fine of $1,058.

Cook-Vivian Merges With Lindenmeyr Division

The Cook-Vivian Co. of 354 Congress street, Boston, Mass., will complete a merger April 1st with the Henry Lindenmeyr & Sons division of Hubbs Corp. The new fine paper distributing firm will be known as Cook-Vivian-Lindenmeyr Co., Inc.

With the removal of Boston Lindenmeyr's fine paper operations to the newly-formed firm, its former coarse paper merchandising department will continue to operate at 200 High street, Boston, under the new name of Charles F. Hubbs & Co. of Boston.

Two Michigan Mills Win Clean-Up Awards

The Constantine Board and Paper Co. and the Rocky River Paper Mill, Inc., were presented plaques the evening of March 22 for their efforts in cutting pollution in the St. Joseph River, Michigan. The citations were made by the St. Joseph County Sportsman and Conservation Club at a special meeting in the social rooms of the public library.

Rocky River president, John C. Plantefaber, accepted the honor on behalf of his firm. Robert T. Weir received the plaque for his brother, Frederick, president of the Constantine company.

Mr. Plantefaber outlined the history of his company's efforts following a State Water Resources Commission in August, 1949. He said the installation of waste disposal equipment "meant the spending of many thousands of dollars originally planned for other mill improvements to meet competitive conditions."

"We hope," Mr. Plantefaber said, "that your club and all citizens in the vicinity of mills will be cognizant of these facts and have patience and consideration for industries confronted with the task of correcting stream pollution."

Oregon Paper Mills Lead Stream Improvement Gain

Oregon's Governor Paul L. Patterson recently declared that conservation of the waters of the state is an important step in planning for the municipal, industrial, agricultural and recreational development of Oregon. He said communities that still discharge raw sewage into public waterways must speedily provide adequate treatment facilities and every industry with a liquid waste disposal problem must follow the example of Oregon's pulp and paper mills, which have virtually eliminated pollution of rivers by their wastes during the past two years.

News from Australia And New Zealand

Under terms of the proposed merger of Australasian Paper and Pulp Co. Ltd. with its operating company, Australian Paper Manufacturers Ltd., the holding company, A.P.P., will go into voluntary liquidation and its holdings of £13,638,212 £1 ordinary stock in A.P.M. will be distributed to A.P.P. stockholders. Preference stockholders in A.P.P. will receive three £1 A.P.M. 6 percent cumulative preference stock units for every two A.P.P. 8 percent cumulative participating preference stock units. Ordinary stockholders in A.P.P. will receive one A.P.M. £1 ordinary stock unit for each one ordinary A.P.P. stock unit. Australasian Pulp and Paper capital is £437,506 preference and £13,474,812 ordinary.

* * *

The Kinleith pulp and paper mills began production well after the Christmas holiday period, the directors of New Zealand Forest Products Ltd. report. Both mills are in continuous production and the outputs being achieved are in line with the company's program. The pulp mill has steadily increased its output to a level above expectations. The paper mill is also operating successfully and showing a steadily increasing output.

Oxford Paper Builds New Power Station

Oxford Paper Co. is well along in the construction of a new power plant to supply its Rumford, Me., mills. The concrete, brick, and glass-brick station will house two 9,000 hp. water wheels that will turn two 6,000 kilowatt electric generators.

Oxford will soon start a long-range program to convert its electrical equipment to 60 cycle frequency, using the new station for the gradual change-over.

United Board Acquires Denson Banner

United Board & Carton Corp. borrowed $2 million from three banks to partially finance its acquisition of Densen Banner Co., Inc., and Densen Realty Co., Inc.

The loan matures in January 1958, and bears interest at 4½ percent. The lending banks were Marine Midland Trust Co., Marine Trust Co. of Western New York and Chase National Bank.

United Board & Carton acquired all the assets, including real estate, box and corrugated plants and equipment of the Densen firms.

Sitka Mayor Goes To Japan As Pulp Adviser

M. S. "Duke" Mitrovitch, the mayor of Sitka, Alaska, has been retained as a technical adviser by Alaska Pulp Co., Ltd. and has left for Japan to confer with company officials relative to constructing the long-proposed mill in southeastern Alaska.

Before leaving on his trip, the mayor told Juneau reporters that "without a doubt" the Japanese pulp firm will go through with its plans to build the mill.

Milsom to Head New International Converting Plant

A new converting plant for the production of Pure-Pak paper milk containers will be opened this spring at 5 Penn Place, Pelham Manor, N. Y., by International Paper Co.

The new plant will produce a new Pure-Pak "flat top" container, a design particularly suited for distribution of milk in large metropolitan areas. Initially, the containers will be supplied to the large dairies in the area but as more equipment is received from the manufacturer, the area of distribution will be extended.

D. D. Milsom, formerly manager of the Single Service plant in Atlanta, Ga., has been named manager of the new Pelham plant and W. J. Andrews will be superintendent.

PAPER PEOPLE

T. M. Gilbert

G. M. Gilbert

T. M. Gilbert Elected President Gilbert Paper Co.

On March 23, T. M. Gilbert was elected president of the Gilbert Paper Co. succeeding George M. Gilbert who is retiring. The change will be effective April 1.

T. M. Gilbert has been associated with the Gilbert Paper Co. since May 1923. At that time he served as secretary, becoming a director in 1925, and treasurer in 1926. He became vice-president in 1947.

George M. Gilbert, who has served as president since March of 1951, completed 40 years of association with the company in August of last year. He will continue as a director of the company.

F. C. Ash Heads Sealright Co.

Sealright Co., Inc., has elected Frank C. Ash president, succeeding Eugene W. Skinner who died on March 1. Mr. Ash also is president of the Oswego Falls Corp., parent company of the Sealright companies. Sealright manufactures paper containers and packaging machinery, which is leased to its customers.

Other newly elected officers are Henry Estabrook, executive vice-president; Culver M. Lussier, vice-president and treasurer; and R. Reid McNamara, vice-president in charge of sales. Martin E. Lower and James R. Murray were also chosen as vice-presidents.

Arentson Succeeds Loomis at Hammermill

Robert W. Arentson, head of the cost and budget section at Hammermill Paper Co., since 1946, has been appointed acting head of the standard sections. He succeeds the late Harold Loomis. He joined Hammermill in 1941.

Bull Joins Pollock

James B. Bull has joined Pollock Paper Corp. as special sales representative for their Columbus, Ohio Paper Mill products.

J. F. Auer Celebrates 50th Anniversary

J. F. Auer of Mamaroneck, N. Y. will have completed 50 years in the paper industry next month. He started with Walter Matthias in Philadelphia in 1904 as a paper salesman and later became manager for Charles F. Hubbs. In 1908 he opened his own office pioneering in the sale of glassine and specialty papers in this country. He reportedly was one of the first to develop and manufacture twisted papers.

In 1912 he formed the Auer & Twitchell Corp. with offices in San Francisco, St. Louis, New York City, Philadelphia and Havana, Cuba as paper importers and exporters.

In 1924 he came to New York and formed the J. F. Auer Paper and Board Corp. which operated mills in Maryland, New York and Pennsylvania.

He reentered the merchants field in 1937 with an office at 551 Fifth Avenue, dealing principally in bulking, book and glossy magazine papers. In 1940 he branched out into rotogravure and aniline printing and paper coatings by forming Gamotone, Inc. He went to Mamaroneck in 1946 and today is devoting his time to the paper business in connection with Gamotone specializing in tissue trade mark papers, coated papers, box papers, book covers and magazine wraps.

C-Z Promotes Three

Conrad Morasch, day foreman at the woodmill of Crown Zellerbach, has been promoted to woodmill superintendent.

He served the usual period on the extra board, in bag shipping as a high lift truck driver, and as head of the field engineers before going to the woodmill as shift foreman in 1950.

He specializes in mechanical engineering and has helped design many machines at the mill.

Fred Conner, electrical maintenance foreman, has been promoted to supervisor of electrical maintenance and operations at the Camas mill. This is the position vacated by the earlier promoting of L. W. Bailie to supervisor of electrical power.

Mr. Conner started at the mill in 1926 on the extra board and went into the electrical department in 1927. He has been promoted through various electrical jobs since.

Leonard Greger is the new assistant supervisor of electrical maintenance and operation at the Camas mill.

He came to the Camas mill in 1946 and has progressed through various electrical and engineering jobs.

Turner Leaves American Tissue After 34 Years

John T. Turner, of 92 Sycamore street, associated with the American Tissue Mills, South Hadley Falls, Mass., for 34 years, severed connections with the firm on March 19.

One of the firm's last remaining veteran employees, Turner said that his future business plans are uncertain. He expects to leave next month on a vacation of several months.

He was a salesman for 20 years and has been assistant sales manager in the sales office during the past 14 years. In recent years the firm has been in bankruptcy proceedings and only a skeleton force remains at the local office and plant. No manufacturing is underway now. One mill has been sold.

(More People on page 38)

TODAY'S PAPER HAS TO

Come Clean!

That Means Your Paper Machine Screens Have To Be Adequate And Up-To-Date

Too many papermakers are judging screen performance and value by 1930 Model Screens. We say this because hundreds of Bird Screens this old or older are still in operation — long past the age of honorable retirement in favor of modern Bird Screens of ample capacity to permit use of the finest screen slots for the given grade, plus gentle, efficient screening action.

Make certain *your* Bird Screens meet 1954 operating standards. When they do, nothing can equal them for producing continuously and uniformly clean, well formed paper to the limit of paper machine capacity.

BIRD MACHINE COMPANY
South Walpole, Massachusetts

Paper Mill Noise Problems

M. N. Davis and R. H. Cáston

Technical Research Associate and Physicist, respectively of Kimberly-Clark Corp.

Abstract

Solutions of a number of mill noise problems are discussed. The background of the development of suction-roll silencers is presented. In Kimberly-Clark creped wadding mills, the use of this silencer has eliminated most of the suction roll noise, reducing the overall loudness in the mills by 40 to 90 percent. Applications of the silencers to book and newsprint machines have reduced the noise; however, in some cases, operating difficulties have resulted from their use.

Introduction

In recent years, there has been a growing emphasis on industrial noise problems. Machines are running faster and are producing louder and more irritating noises. After a generation or so of experience, we are beginning to realize that continued exposure to loud noise can cause deafness. Indeed, hearing impairment due to excessive noise is now considered to be a compensable occupational disease in some localities.

This discussion is in the nature of a progress report. We do not have all the answers to the noise problems in pulp and paper mills but we feel that our progress should be brought to the attention of this group for whatever benefit may be derived from our experience and to stimulate interest in the common problem of noise.

General Methods of Solving Noise Problems

Before taking up specific noise problems, we shall very briefly discuss the two general approaches to all noise problems. They are:

1. Eliminate the noise at its source.

2. Reduce the noise level at the listener by altering the path between the source and the listener.

By far the most effective way of combating a noise is by the first method. There are as many variations of this method as there are sources of noise. They are usually of a special nature, such as the substitution of a welding operation for a noisy riveting operation or the redesigning of a machine to stiffen or eliminate a vibrating, noise-producing member. Papermill applications of this method will be taken up later.

In the second method of noise reduction there are several variations. For example, the path of the noise may be blocked by covering the source with a sound-proof enclosure; we may block the noise by isolating the listener, *i.e.* we may put him into the sound-proof enclosure, or we may block the noise with ear plugs or ear muffs. Finally, the noise intensity for some listeners may be reduced by adding sound absorbing materials to the room. Each of these methods of noise reduction has its limitations. As a general rule, the path-altering approach is used only when it is impossible to reduce the noise at the source.

General Noise Sources in Pulp and Paper Mills

In recent years, we have conducted a survey of the noise sources and noise levels in most of the mills of Kimberly-Clark and its affiliates. In this survey, data on the noise levels in octave frequency bands over the audible range were obtained by means of a General Radio sound level meter and octave band analyzer. The sound level meter indicates the total noise intensity in decibels. The octave band analyzer is simply a device for measuring sound levels in a narrow band of frequencies. The audible frequencies run from about 20 cycles per second to 15,000 cycles per second and the analyzer divides this range approximately into octaves. The first octave band is between 20 and 75 cycles per second. The rest are true octaves, 75 to 150 cycles, 150 to 300 cycles, etc., to the last octave band which runs from 4,800 cycles to 10,000 cycles. Sounds of frequencies higher than 10,000 are usually not very intense and are commonly ignored when considering noise.

These data are recorded in decibels. While the decibel is a very convenient device for the physicist and engineer to use in recording his data, it is unfortunate that the ear is not aware of this fact.

In order to translate decibels into something which indicates how loud a noise sounds, we resort to tables such as those prepared by the American Standards Association (1) for this purpose. In reporting loudness reductions, we have used the loudness as read from this table.

The octave band data are of value for two reasons. First, the intensity of the noise in the various octave bands provides a clue as to the character of the source. Second, it is necessary to have the noise data in this form when we try to estimate the importance of an environment in regard to probable hearing impairment. The experts in this field have indicated that a noise of high frequency is potentially more dangerous to the ear than a noise of the same intensity at a lower frequency.

Noise sources in the mills which we have found to be loud enough to cause concern are: 1. chippers; 2. motors; 3. refiners; 4. drum barkers; 5. saws; 6. vacuum pumps; 7. air hoses; 8. suction rolls.

In general, in trying to reduce the noise levels in our mills, we have been guided by the seriousness of the exposure of the personnel to the noise. Loud noises which are seldom heard by mill personnel have been ignored. While they are loud, they are usually in out of the way places and we have not made serious attempts to quiet them. If necessary to quiet them, they would seem to be amenable to the technique of housing the noise.

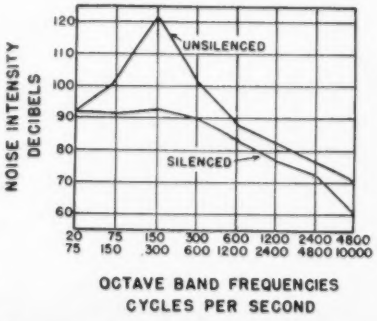
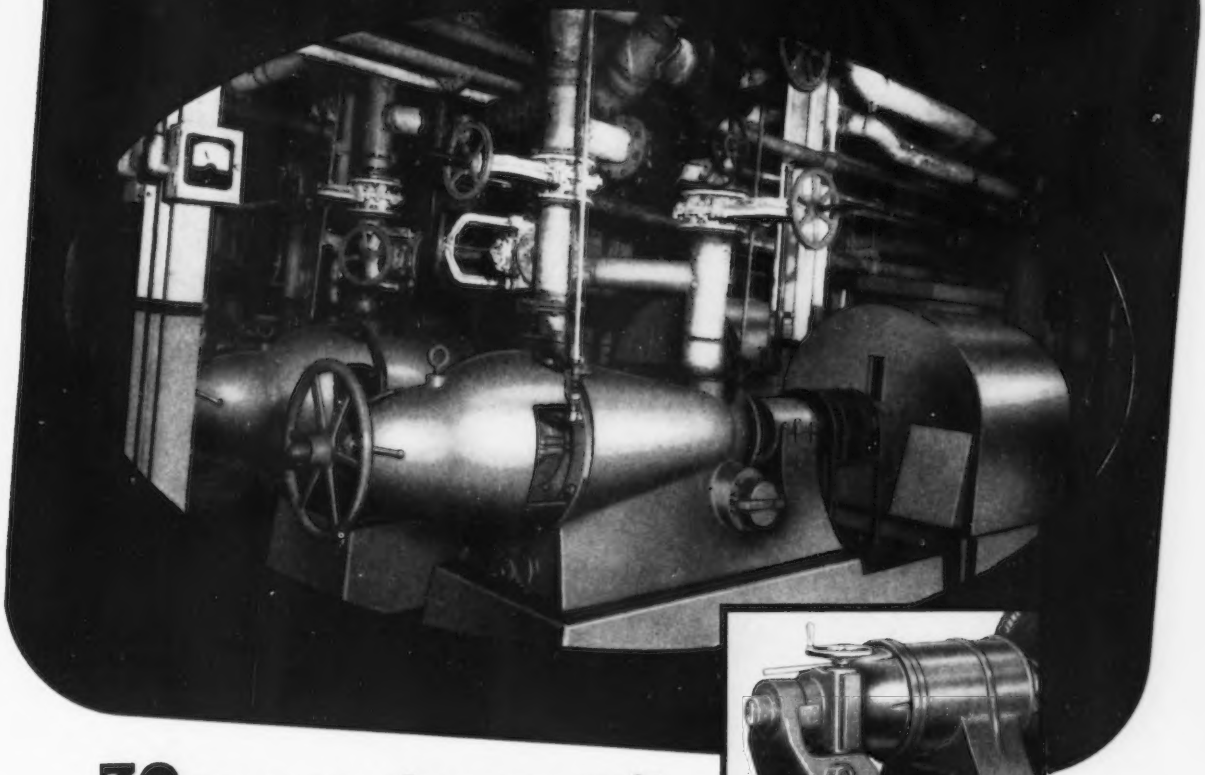


Figure 1. Noise spectra of vacuum pump discharge.

ANOTHER E.D. Jones INSTALLATION



30 tons per day per unit on screenings

That's the production of these two Fibremasters at Anglo-Canadian. Rugged machines for rugged work. Power usage only 160 HP per unit. Freeness drop from 750 cc to 500 cc (CSF).

The Fibremaster, though it requires relatively small floor space, has twice the capacity of the well-known Jones High-Speed Refiner — without sacrificing any of the features that have made the smaller machine so popular.

As a general utility unit, on all stocks from news to rag, the Fibremaster combines flexibility, improved stock control, low power and maintenance cost. Ask your Jones representative or write for Bulletin No. 1035.

Now available with ACCRU-SET® automatic plug adjustment

This latest triumph of Jones engineering provides completely automatic, completely reliable control of plug adjustment for uniform, pre-determined treatment throughout your run, less operating horsepower, adequate protection for plug and shell fillings if power or stock flow fails. Easily installed on any Jones Jordan, Fibremaster, Stockmaster or Refiner. Write today for our Bulletin No. EDJ-1057.

E.D. Jones

E. D. JONES & SONS COMPANY
PITTSFIELD, MASSACHUSETTS

BUILDERS OF QUALITY STOCK PREPARATION MACHINERY

important announcement

No. 4 Machine
NEKOOSA-EDWARDS
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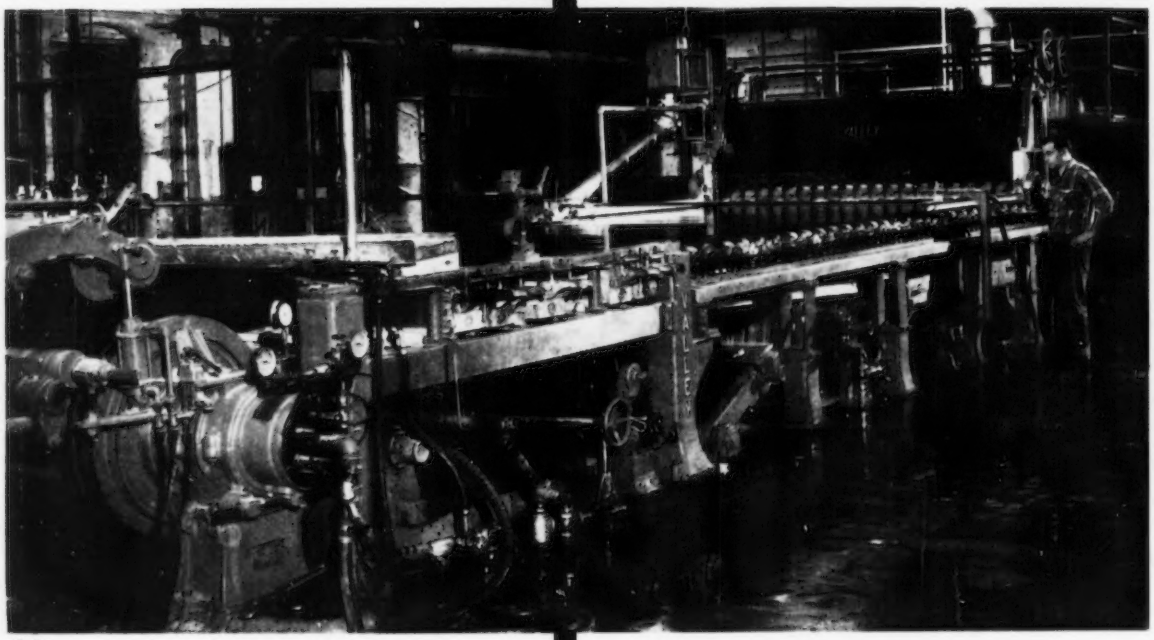

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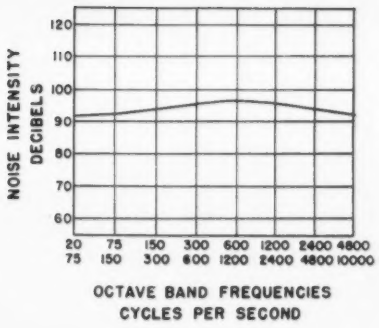

Figure 2. High pressure air spectrum.

In the case of drum barkers and slasher saws, we have encouraged the wearing of ear-protector devices for operators who must work in the vicinity of these machines. We know of no method of quieting drum barkers. U. S. Pat. 2583238 by Donald E. Sutton describes a method of silencing circular saws but we have not tried this device.

We found vacuum pump discharges to be a particularly loud and annoying source of noise. The application of suitable commercially available mufflers to the discharge of these pumps has virtually eliminated these noises.

In *Figure 1*, this silencing action is indicated by the noise spectra of vacuum pump discharges taken from our noise survey. In these plots, the frequency limits of the octave bands are indicated on the abscissa and the intensity of the noise level in decibels in each octave band gives the ordinate of each point. The upper curve gives the octave band noise levels obtained in an area where an unsilenced vacuum pump is operating. The data of the lower curve were obtained near a vacuum pump which had been provided with a silencer. Although these are not curves from the same pump, they illustrate the effect of the silencer. In the spectrum of the silenced pump, we have no evidence of any peaks due to the pump discharge but only the usual type of general noise spectrum. It is our experience that the overall loudness can be reduced by 85 percent by the use of these silencers.

Another source of noise which is annoying because it has many high frequency components is the hiss of compressed air used in some mill applications. A spectrum of this noise, which comes from the turbulence set up at the air nozzles, is shown in *Figure 2*. While there are no noise peaks in this spectrum, it is of interest to note the unusually high noise levels at the high frequency end of the spectrum. In our experience, we have been able to reduce this noise by enlarging the nozzles and using air of lower pressure. Loudness reductions of 58 percent were obtained by this treatment on newsprint calender stacks.

Suction-Roll Noise

While most of the noises mentioned above are important in themselves, we are and have been most concerned with the suction-roll noise. This serious problem has been with the industry for a number of years. In 1937, Kimberly-Clark engaged Dr. E. J. Abbott to analyze the noise in one of its mills. As a result of this association, the Beloit Iron Works, which supplies a majority of the suction rolls for Kimberly-Clark, retained Dr. Abbott and J. D. Krause to work on this problem. The result of their work was a practical solution to the noise problem which is the subject of U.S. Pat. 2274641. The Beloit Iron Works holds the licensing rights to this patent. At the time of the development of this silencer, noises were measured by ear more than by any other method. For the first installation of this silencer on a creped-wadding machine in our I.V mill, it was reported that the noise was lower than for other machines of this type and that the gears were the primary remaining source of noise on the machine. In the years that followed, the Kimberly-Clark creped-wadding mills grew noisier and noisier in spite of the fact that their suction rolls were provided with silencers. It became a commonly accepted belief that the Abbott and Krause silencer cannot be made to operate effectively in the mills. The ineffectiveness was attributed to an inherent difficulty in adjusting the silencer properly to the change in the silencer dimensions from wear. It was for this reason that Kimberly-Clark started an intensive research program on noise in 1947. After trying a large number of silencing schemes, and finding that none of them could produce the 30 db noise reduction which was claimed by Abbott and Krause, we decided to reinvestigate their experimental work.

The results of this investigation were reported by J. P. Nash. (2) He showed that large noise reductions were obtained by this silencer if the gap *size* and *shape* are correct and if the silencer is properly covered. It is now known that the apparent failure of these silencers in our mills between 1937 and 1947 was due to the fact that our application did not conform closely enough to the specifications laid down by Abbott and Krause.

Silencer Operation

Abbott and Krause stated that the sound generated by a roll of this type is produced by pressure waves generated when a volume of air is suddenly placed in communication with another volume of air at different pressure. Such discontinuity of pressures occurs at two points, first when the holes containing air at atmospheric pressure come into communication with the suction chamber and second when the holes containing air at the suction-box pressure come into communication with atmospheric pressure. These two pressure discontinuities are shown in *Figure 3*. They state that the second discontinuity is more important. It has been our experience that the first discontinuity produces so little noise that it is not necessary to attempt to silence this point. According to their invention, the quieting of the roll is achieved by providing a gradual change in pressure as the holes move from the suction area past the sealing strip. In Figure 4, which is a cross-section of the dry side of a suction box, this gradual change in pressure is accomplished by means of the strip of material which we call the silencer. This material is cut to have the same radius as the inside of the shell. Its centre is offset so as to provide a crescent-shaped gap between the inside of the shell and the silencer strip. The air entering the holes must pass through this gap which decreases to zero as we approach the holes of highest vacuum. This restricted passage slows the rush of air into the holes of the suction roll, causing a gradual change in pressure. This gradual change in pressure produces no noise.

As our experience from 1937 to 1947 indicates, the shape of the gap is very

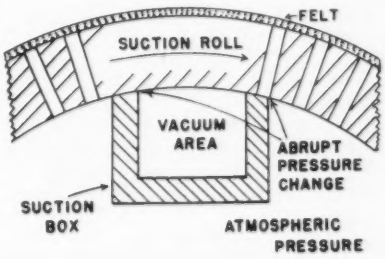

Figure 3. Suction roll noise source.

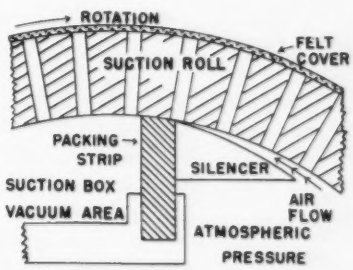

Figure 4. The Abbott and Krause silencer.

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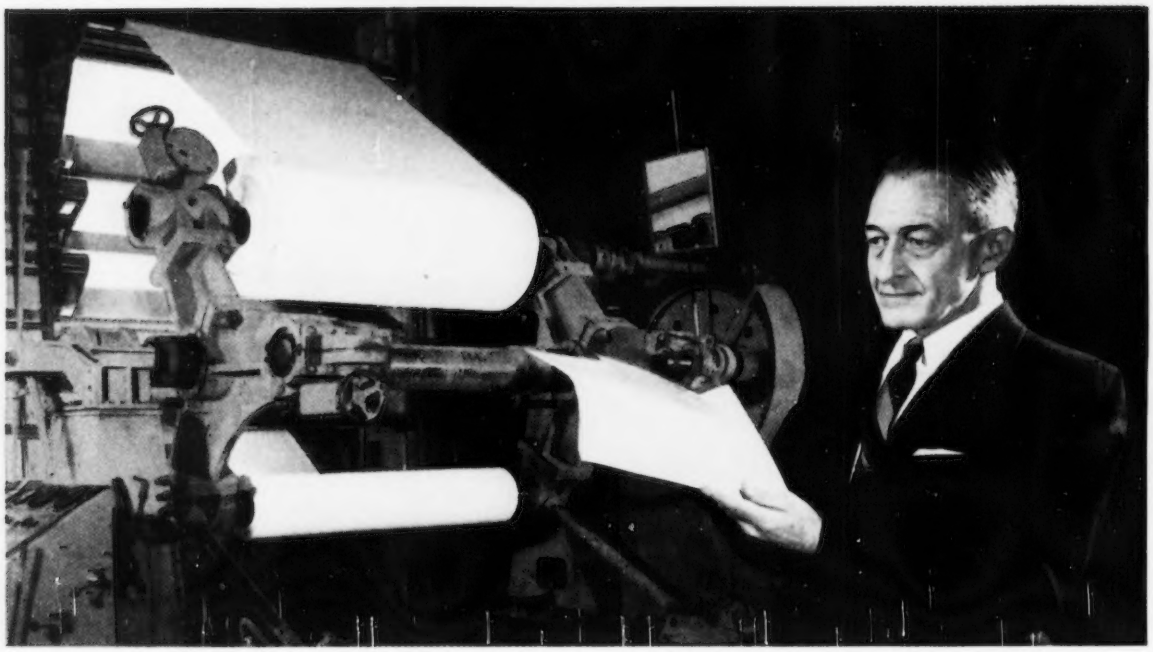

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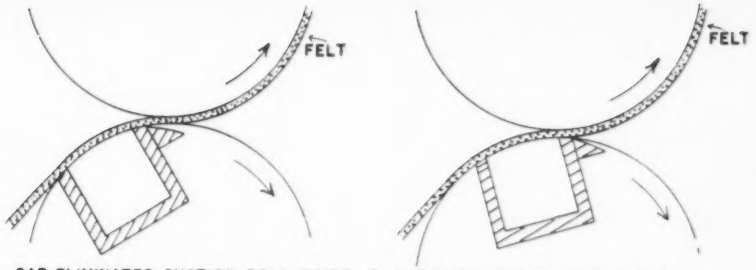

A. GAP ELIMINATES SUCTION ROLL NOISE B. GAP HAS NO EFFECT ON NOISE

Figure 5. Effect of Silencer Cover.

important and must conform to the area described above.

The size of the gap is of less importance. Abbott and Krause, in their report, suggest on theoretical grounds that the gap size is given by

$$G = 0.43\ L\ (kV)^{0.7}$$

where

- G is the maximum opening of the gap
- L is the length of the gap
- V is the volume of the individual holes
- k is a constant which depends on speed for the most part.

For speeds above 1500 f.p.m., we find that a value of k of 0.8 gives a satisfactory gap size although deviation of as much as ± 50 percent from this size have yielded quiet operations in an experimental suction roll.

In order to control the rush of air from the inside of the roll, the outside of the roll must be covered. In *Figure 5*, a typical suction wringer of a Yankee-type creped-wadding machine is shown with the suction box in two positions. In position A where the silencer is covered by the nip, the noise from the roll is reduced by 80 percent when the gap is opened. In position B the gap size has no effect on the roll noise because the air may enter the evacuated holes from the outside.

In one case, on an experimental adjustable gap, maximum silencing was obtained with the gap completely closed. We feel that the result arises only when the felt covering the silencer has the proper porosity.

Operating Experience

We have installed 55 of these silencers on press rolls of the Yankee type of light-weight tissue machines. In every case where sufficient felt wrap is available and the silencer is properly shaped, the suction-roll noise has been eliminated. Depending on the background of other noise present, this has resulted in overall loundness reductions of 40 to 90 percent. We still have trouble with the wringer arrangement, which is shown in *Figure 5*, since a normal operating position (B in *Figure 5*) is not quiet. Since this roll is the only source of noise which stands in the way of a really quiet machine in a great number of our mills, it is surprising how many of our machine tenders have found that the machines can be operated without vacuum on the wringer rolls.

In the foregoing, we have stressed the necessity for maintaining the shape of the gap. In the early unsuccessful installations, the silencers were mounted to fixed members in the suction box while the packing strips were allowed the normal flexibility to provide a better seal and to facilitate the assembly of the suction roll. We have found that the gap shape is much better maintained if the silencers is mounted directly to the packing strip. For the first installation a great deal of careful workmanship is necessary. The new seals must be made to fit the contour of the roll and the silencer gap must be carefully cut to the proper size and shape. A template laid across the suction box guides the workman in this operation. The cutting is usually done with a power sander or a file.

Normal wear has not interfered with silencer efficiency and maintenance has been limited to redressing the silencer strips to fit the template. This operation is performed every six months or every year, depending on the wear in a particular case. In the redressing, material is removed from the silencer without touching the inner portion of the packing which provides the vacuum seal and thus the vacuum seal is maintained for the normal life of the packing.

So far, we have described our success on the Yankee type of machine, which carry top and bottom felts and are used to produce light-weight tissue stock from 100 percent chemical pulp. In theory, there is no reason why this same silencing scheme is not applicable to other types of machines if the air control principles given by Abbott and Krause are adhered to.

We have installed these silencers in two suction-couch rolls and two suction-press rolls of newsprint machines and on two suction-couch rolls of book machines. In each case, loudness reductions of 50 to 75 percent were obtained. In the course of the trials, a new set of problems has been encountered. In the case of couch rolls, it is apparent that the draw line and the chance of rewetting the sheet are very sensitive to the vacuum conditions at the dry side of the suction box. Unless the draw line is straight and the silencer is very carefully fitted to the roll, operating difficulties may occur at the draw line. In some cases, these troubles have resulted in costly reduction in production and the silencer strips were removed. In one case where the silencer was tolerated long enough to ensure a very good match between the silencer and the inside of the roll, the silencer is being operated successfully.

In the press rolls, the alteration of the vacuum break on the dry side of the suction box has resulted in a reduction of felt life due to plugging. This silencer is still in operation only because the felt life can be extended by removing the felt from the silenced press after one week of operation and transferring the felt to an unsilenced press. By this expedient, normal felt life is obtained and we are able to continue our search for the combination of felt construction, felt travel, silencer length, and silencer position which will permit normal operation on a silenced press.

We know that these silencers eliminate noise. In spite of operating difficulties, we are not discouraged but feel that some combination of silencer gap, length, and box position can be found which will silence all suction rolls and still no interfere with machine operation.

References

(1) "American Standards Association" —Z24.2—1942: Printed in the *Journal of the Acoustical Society of America*; Vol. 14, No. 1, 102—110, July, 1942.

(2) Nash, J. P.: Elimination of Suction Roll Noise; *Tappi* 23, 293-297; July, 1949.

Note:—Paper presented at the Annual Meeting of the Technical Section of the Canadian Pulp & Paper Association, Montreal, Que., January 27, 28, 29, 1954.

Wyomissing Moves United's Operations to Reading

United Manufacturing Co., Springfield, Mass., is being moved to West Reading, Pa., home of the Wyomissing Glazed Paper Co., which bought the concern last April.

United will retain its corporate name although its facilities will be merged with those of the parent company. Wyomissing also operates the Reading Glazed Paper Co. in Reading, Pa.

Moving of the equipment will be completed in from 60 to 90 days.

Manufacture of Hardboard In the United States

George G. Marra—Washington State Institute of Technology

Written especially for Paper Trade JOURNAL

The hardboard industry, having established itself as a means of salvation in the ever-tightening sphere of forest products utilization, is becoming more and more complex as research and technology constantly introduce variations into the processing techniques. This report reviews the status of the industry, citing reasons for its rapid development and presenting indications of future trends. A classification of processes based on particle types and methods of forming is proposed and is followed by process descriptions as well as production capacities for each producing unit. Essential differences between processes and products are brought out.

About the Author

George G. Marra obtained B.S. and M.S. degrees in wood technology from Syracuse University and a Doctor of Forestry degree with major in wood technology from Duke University. Now head of the Wood Technology Section in the Division of Industrial Research, Washington State Institute of Technology, Pullman, Washington, he was formerly Associate Professor of Forest Utilization at West Virginia University. He is a charter member of the Forest Products Research Society and chairman of the Society's subject matter committee on Composition Products. He is also a member of the American Society for Testing Materials' sub-committee on Structural Fiberboard and a member of the Northwest Hardboard Co-ordinating Committee, a group organized to accelerate the establishment of products standards for the industry.

Recent years have witnessed rapid progress and growth in the hardboard industry of the United States. Production capacity has geen doubled since 1945 and new plants scheduled for commercial operation in 1954 will add significantly to the yearly output. The year 1953 brought in additional production capacity estimated at 184,320,000 square feet yer year, $\frac{1}{8}$-inch basis*; the year 1954 is expected to add another 242,400,000 square feet. Total production capacity by the end of 1954 is expected to exceed 1,763,160,000 square feet per year.

The most remarkable feature of this entire development is the fact that its raw material supply is based largely on residue wood not suitable for solid wood products and formerly wasted or burned as fuel. Slabs and edgings from sawmills, cores and trims from veneer mills, and miscellaneous millwork residues are typical raw materials for this industry. Thus, a product of high utilitarian value is being created in increasing quantities with no additional drain on our timber resources.

Hardboard appears to be emulating plywood in the wide diversity of uses which are increasing daily in number. Typical uses include: home construction and remodeling for such items as floor underlayment, partition, ceilings, doors, wainscoting in playrooms, and built-in cabinets; furniture such as in case-goods backs, drawer bottoms and mirror backs; conveyances such as in trailers for both interior and exterior, automotive, boats and freight cars; in merchandising for displays and fixtures; in industry for bins, partitions, lockers, bench tops and flooring. Exterior applications have also proved successful and are a major field for further exploitation.

The essential properties of hardboard which account for its increasing acceptance as a construction material are its large sizes, surface hardness and smoothness, high strength and uniformity both in regard to properties and in regard to color, thickness and density. From a manufacturing standpoint, hardboard is a product whose properties are subject to control and hence amenable to change in order to meet fluctuating consumer requirements.

In view of the large amounts of residue material available in the forested regions of the country, it appears that the hardboard industry can be expected to undergo further expansion as more markets are developed and become established. The Northwest region contains many lumber and plywood manufacturing plants which normally develop large volumes of residual wood suitable for conversion to hardboard. In many cases these materials are available in sufficient quantity at a single site to support a hardboard operation. The economic advantage of large raw material supplies near at hand and the large-volume production thus permitted are the principal reasons for the mushrooming development of the hardboard industry in the Northwest.

Strangely enough, progress in the hardboard industry has rendered the term "hardboard" incapable of precise definition because of the many process variations which have been developed. Originally the term referred to a hard, smooth sheet product typified by a specific gravity of approximately 1.0, a composition of pulp-type fibers resembling ground-wood stock, and thicknesses of $\frac{1}{8}$", $\frac{3}{16}$" and $\frac{1}{4}$". Departures of various magnitudes from all three of these basic attributes may now be observed in commercial products. Some of these variations involve differences in the basic particle and some involve differences in methods of manufacture. The end products, consequently, have points of dissimilarity and may retain only the primary characteristic of being denser and harder than the original wood from which they were made. For example, boards of specific gravity lower than 1.0 are being produced of pulp fibers for use where maximum strength and hardness are not required. Also, boards of 1.0 specific gravity are being produced

* All production capacity data in this report have been reduced to equivalent $\frac{1}{8}$-inch basis to facilitate comparison.

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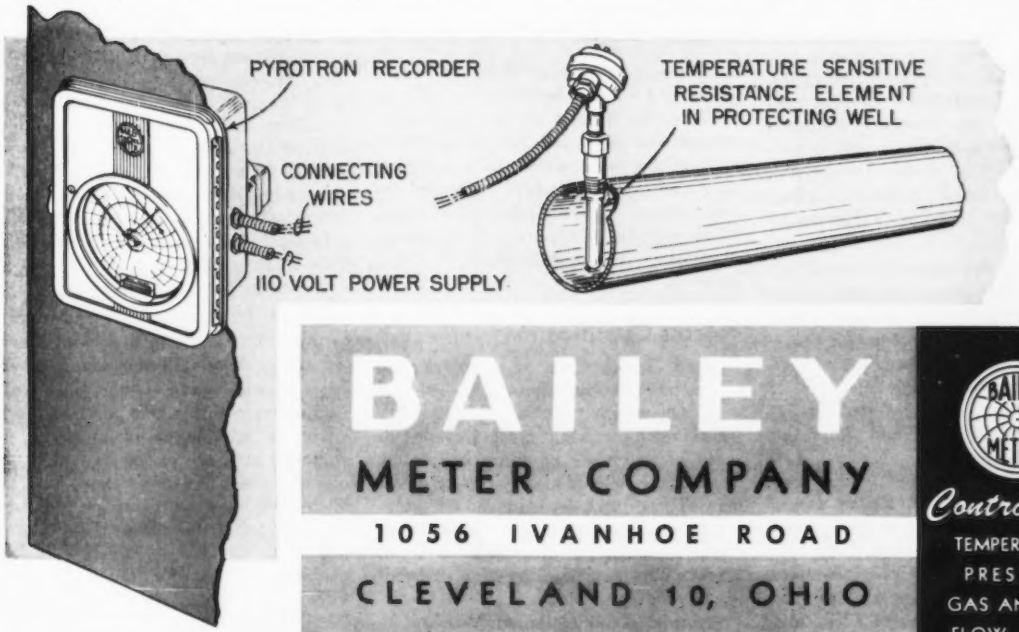

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"The most remarkable feature of this entire development is the fact that its raw material supply is based largely on residue wood not suitable for solid wood products and formerly wasted or burned as fuel."

of stock other than pulp fibers—material best described as granulated or pulverized. Another variant involves sheets of thickness up to and exceeding ¾" for use as cores in overlay products. More recent developments are introducing boards made of special high-strength, shred-like particles of wood and boards incorporating large flake-type particles. The larger the partcles, the more unlike the product becomes to the accepted concept of hardboard. Surface smoothness is one of the properties affected by particle size.

From an end-use standpoint, it is similarly difficult to make distinctions between some of these products. Each is inherently a multiple-purpose board and, hence, overlapping uses are common. As both test data and service data accumulate on the various products, it is reasonable to expect that consumer demands will become more sharply defined, and this in turn may have the tendency to assign specialty roles to certain products. Recent activity by associations and societies may also accelerate the establishment of classifications and standards for composition board products. The American Society for Testing Materials has set up Sub-Committee XV on Structural Fiberboards within Committee D-7 on Wood to consider the problems of testing and standards for this product. A Hardboard Association has been formed whose primary function is to prepare and maintain industry standards for member producers. The Forest Products Research Society also has a committee devoted to the progress of this phase of wood use. More recently, TAPPI has taken initial steps to provide service to hardboard industries.

Much of the credit for the rapid advances in the hardboard industry is due the resin manufacturers who have been exceedingly diligent in formulating new resins to meet the peculiar needs of each process. Research on new methods of resin application have resulted in increased resin efficiency and improved board properties. Equipment manufacturers have also responded to the need for specialized tools for efficient manufacture of hardboard. Particularly noteworthy are the ingeneous automatic press loaders and unloaders which have reduced the time on this operation to less than a minute. These loaders and unloaders have successfully integrated the characteristic batch-type operation of the multiple-opening press with the continuous processing normally associated with all other phases of hardboard manufacture.

The pressing operation itself has been subjected to tremendous developmental effort. Recently, a manufacturer of hydraulic presses announced the availability of a 30-opening hardboard press with 4-feet x 16-feet platens. The capacity of this press is three times the capacity of the standard 20-opening, 4-feet x 8-feet press. Also under development is a hardboard press which eliminates the conventional rams and substitutes instead a single rectangular ram as large as the platens. In Europe, a continuous press and an extrusion machine for composition board, both long-standing dreams of wood processing engineers, have become realities. Of these, the extrusion process, which combines both the forming and pressing operations, is already in operation in several plants in this country. A corporation to promote the continuous press has been formed in New York City.

In the wet forming process, the fourdrinier machine has undergone a natural progression from insulation and wallboard manufacture to hardboard manufacture. Although no basic changes were necesary, improvements have been made to meet the more exacting requirements of forming hardboard mats. Noteworthy advances in these machines include the incorporation of strain gauges under one of the lower press rolls to indicate the weight of material going through the press and also the pressure used in the press section. The addition of suction press rolls now facilitates the manufacture of smooth-two-sides board which requires a minimum of formation disturbance and a maximum of water removal.

Process Classification

Since hardboard, as pointed out above, has developed beyond its original restricted meaning, a discussion of hardboard manufacturing must include all types of processes in order adequately to cover the field of closely related products. Those processes based on pulp-type fibers, however, are by far the predominant methods of manufacture and produce the more familiar type of hardboard product.

A broad classification of board processes will aid in defining major differences in manufacturing procedures and final product. The first subdivision of hardboard processes can best be made on the basis of the type of particle used since this has an important influence on both the method of manufacture and the properties of the finished board. Particles range from pulp-type fibers and pulverized material to granular shapes of various sizes. Still larger particles in the form of veneer-like flakes and shreds have been successfully incorporated into boards and other processes now in pilot plant operations will soon reach the status of commercial production. Some products combine a granular core with special flakes on both surfaces, others combine a granular core with pulverized wood on the surfaces.

The second sub-division is on the basis of method of forming the board. One group, the wet processes, employ water as the felting medium: a second group, the dry or semi-dry processes, employ air as the felting medium. The wet processes are all strictly fiber processes and the products are frequently referred to as "hard-pressed fiberboard". Using water to convey the fiber from step-to-step, to distribute resins and chemicals, and finally to form the board, these processes were greatly aided in their early adaptation to hardboard manufacture by the body of knowledge supporting the pulp and paper industry. The wet processes have been particularly advantageous for large-scale production of hardboard. The dry processes, on the other hand, include fibers as well as all other types of particles. The application of the term "air felting" to the granular particle boards may be a misnomer because the air, strictly speaking, is not used to distribute the particles and the shape of the particles permit very little actual felting. Being of more recent origin, the dry processes have had tediously to develop a new set of working principles and techniques before production plants were possible. With the advantage of versatility, the dry processes appear to have great promise for the future. The majority of installations scheduled for commercial operation in 1954-55 are of this type.

A third sub-division of hardboard processes further defines the method of forming the mat as to whether it is continuous or batch. In the wet processes, for example, the mat may be formed continuously with either a cylinder machine or with a fourdrinier-type machine, or may be formed batchwise, i.e., one at a time in a deckle box. A further distinction may be made on the basis of condition of the mat at time of pressing. Some processes hot press the wet mat immediately after forming, using a screen backing to permit escape of the steam generated in the board: other processes pass the wet mat first through a drier and then into the hot press with-

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out a screen. The latter technique produces a "smooth-two-sides" board while the former is smooth on one side only. The dry or semi-dry processes are similarly differentiated as continuous or batch although the methods differ and the boards are usually smooth on both sides. The dry pressing of wet-formed fiber mats is sometimes classified as a "dry" process, but it seems preferable to reserve this descriptive term for the many waterless processes which contrast sharply with those employing large volumes of water to handle the fibers.

This classification was used in Table I which also lists manufacturers and production capacities. Listings under granular batch forming processes are not complete since many operations of this type are small and the output is entirely incorporated into other products in the same plant.

Wet Fiber Processes

Forest Fiber Products Co., Forest Grove, Ore.

This is a typical wet continuous process with a rated production capacity of 5,200,000 square feet per month. Approximately 80 tons of sound, bark-free sawmill residues are processed daily, 70% of which come from the parent mill, the Stimson Lumber Company, and 30% is brought in from outside sources. The raw material for the process is manually picked from the residue conveyor and sent to a 66-inch, six-knife chipper which produces chips about one-inch along the grain. After screening, the acceptable chips are conveyed to a chip bin and the oversize and undersize pieces are sent to the fuel bin.

Tramp metal is removed by magnets as the chips move from the bottom of the chip to the horizontal cooker. While in the cooker, the chips are subjected to steam pressure of 150 pounds and a temperature of 360 degrees F. which softens the lignin between the fibers. The softened chips are then forced into two Type "D" Asplund Defibrators of 40 tons capacity each. These revolving disc mills grind the chips to shreds and fibers in the presence of steam at elevated pressures. Discharging to a blow pit to separate the steam, the fibers are next fed by conveyor into four No. 400 Bauer refiners with water added as it enters the machine. The action of the Bauer is such as to further separate the fibers and at the same time produce a degree of fibrillation which contributes significantly to the properties of the finished board. Dropping into a stock chest at 4% consistency, the fiber slurry is constantly agitated with a propellor to prevent settling of the fibers.

The fiber slurry is then pumped to an automatic consistency regulator and then to a washer which removes undesirable soluble materials. After adding fresh water at this point, the required chemicals are introduced and thoroughly mixed. The chemicals include sizing agents, alum, resins, and sulphuric acid to control the pH of the slurry. This mixture passes through another automatic consistency regulator for further reduction in consistency before entering a Downingtown forming machine where the board is formed continuously on a fourdrinier wire. Machines of this type are rated at 200,000 square feet per day per 4-feet width of trim of ¼-inch hardboard. Five suction boxes followed by six pony presses and three sets of main rolls perform the dewatering operation. A water jet then automatically cuts the wet board into 16-foot lengths. Corresponding to paper-making operations, an important feature of wet board processes in general is the ease with which trim material or faultily formed mats may be returned to the process for re-use.

The next step involves hot-pressing in a 20-opening, 4 x 16 foot press. At this point, the conversion from continuous processing to batch processing becomes necessary and is accomplished by a special press loader and unloader of their own design (patent pending). In this system, the mats from the cut-off jets are timed automatically with wire screens which feed upward into position from below. The screen and mat then move together into the loader which is mounted on a hydraulic elevator. The elevator moves upward one space at a time until all 20 mats are loaded and in position to charge into the press. The charging of wet mats and the discharging of pressed boards occurs simultaneously while the next mat is entering the press loader. This precision timing and rapid action of the press loader enables the forming machine to perform its essential function of continuous board formation.

During pressing, stainless steel caul plates on the top of the board impart a smooth and glossy surface to the board while the bottom surface in contact with the screen is patterned with the wire impression. In consolidating the mat, the press carries the dewatering operation to almost complete dryness and fuses the fibers together. A temperature of 380 degrees F. and a pressure of over 800 p.s.i. are required to accomplish the proper action.

As a final step in the board manufacturing operation, the moisture content of the board is restored to a normal level of five to six percent in a humidifier. Humidification is performed by controlled steaming for four to six hours.

Before shipment, some of the boards may be treated to increase their water resistance and strength properties. Treating consists of impregnating with a special oil and then baking in an oven for three to six hours after which moisture content is again normalized by humidifying for six to ten hours.

A significant activity of this plant is its remanufactured products. These include special size-cuttings to order for industrial uses such as doors, drawer bottoms, and furniture parts; tongue and groove panels for interior wall paneling; and multiple-thickness laminates for cabinet doors and other uses. Another outlet, hardboard-faced plywood, requires removal of the screen impression and planing to exact caliper.

The control of quality is an important phase of hardboard manufacture and although a high degree of automatic control of critical factors is possible in wet processing, human judgment is still required to produce material to specification day in and day out. The selection of sound, clean wood from the waste conveyor is one example of such quality control. Adjustment of cooking and grinding conditions to daily and seasonal fluctuations of wood condition in order to obtain desired pulp freeness is another example. Constant checks of board properties, particularly modulus of rupture, water absorption, caliper and density are made to insure against variation in quality of chemical additives or variation in proportioning instruments and control mechanisms. Finally, inspection of surfaces for blemishes, fiber pulls and other visible defects which affect grade, further contributes to quality production.

Masonite Corporation, Laurel, Miss. and Ukiah, Calif.

The Masonite process is regarded as the forerunner of the hardboard industry as it stands today. Having originated and pioneered the manufacture of hardboard, the Masonite Corporation has long been the world's largest producer with a number of plants in foreign countries in addition to those in Canada and the United States. The Mississippi and California operations have a production

capacity of 56,900,000 square feet and 31,590,000 square feet per month, respectively, which is more than twice the production capacity of all other domestic hardboard plants combined.

Typically a wet continuous process, it differs from all other hardboard processes primarily in the manner in which the chips are reduced to fiber. The well-known steam gun explosion technique developed by W. H. Mason in 1924 is still in use and is the first step in the production of fiber for the board. Screened chips are charged into vertical steel cylinders or "guns," which are then closed tightly and filled with high pressure steam. This treatment produces a softening of the lignin cementing layer between the fibers. With split-second timing, the pressure is maintained at 350 p.s.i. for 30 to 40 seconds and then raised to 1000 to 1200 p.s.i. for five seconds. While maintaining full pressure, a quick-acting valve at the bottom of the cylinder is opened and the chips, now with high internal pressure, emerge from the gun with explosive force sufficient to cause disintegration into fibers and fiber bundles. After separating the steam from the fibers in a cyclone, the fibers drop to a stock chest, are diluted with water and then subjected to single and repeated refining operations in Sprout-Waldron refiners. Petrolatum or paraffin is added to improve water resistance of the board. An important feature of this process is the dependence upon reactivation of the lignin to re-bond the fibers rather than upon resin additives.

A Fourdrinier machine is used to form the wet lap and this is cut into 4-feet x 12-feet mats with a traveling cutter. The mats load into a 20-opening stationary rack which then discharges to movable racks. These, in turn, carry the mats to the presses.

A variety of densities, surfaces and treatments are included in the Masonite line of products. A process modification at the Ukiah operation permits some of the wet-formed mats to be dried before pressing in order to produce a smooth-two-sides board. This product requires the use of suction press rolls on the forming machine and a mat drier.

U. S. Gypsum Co., Greenville, Miss.

This plant, with a production capacity of 6,500,000 square feet per month, is also one of the early producers of hardboard in the United States. It is a combination softboard-hardboard operation with the same fiber furnish entering both products by a process which differs from all others in several respects.

Two methods are used to produce the fiber. Conventional stone grinders are employed to fiberize cottonwood and willow cordwood, while Bauer mills grind other hardwoods after first chipping and steaming. The two types of fiber are mixed and the resulting pulp is then thickened, a drying oil emulsion added, followed by a precipitant. This mixture is then diluted with machine water and sent to the forming machine. Continuous mat formation is accomplished by means of a single-cylinder Oliver filter 12 feet wide. The wet mat is cut to 12-foot lengths with a traveling saw and the 12-foot x 12-foot mats are all sent through a drier. After drying, the mats are further cut to 4-feet x 12-feet sizes and stored to await pressing. When sufficient hardboard mats are made, the cylinder machine continues to produce mats for the softboard line.

The hardboard mats are redried before charging to the hot press and the resulting product is a smooth-two-sides board. Press cycles are in the order of one to two minutes.

Oregon Fiber Products, Inc., Pilot Rock, Ore.

A softboard-hardboard combination plant is now under construction and is expected to be in operation early in 1954. The process will be similar to that of the U. S. Gypsum Company and will have a production capacity of 7,800,000 square feet per month. U. S. Gypsum will also handle the entire output of the plant. Outstanding difference between this and the U. S. Gypsum process will be the use of a 12-foot wide Downingtown fourdrinier and press instead of a cylinder. This machine is the largest of its kind in the world.

Oregon Lumber Co., Dee, Ore.

This is a continuous wet process employing a Downingtown Fourdrinier board-forming machine and a 20-opening, 4-feet x 16-feet hot press. The capacity is 4,680,000 square feet per month.

Several unique features are involved in these operations, most outstanding of which is the use of high percentages of bark in the product. The presence of bark on otherwise usable residue wood has always been a bane to its utilization. This company, led by the late A. C. Lighthall, Sr., president, and Dr. A. B. Anderson, sought to incorporate as much bark as possible into the board and take advantage of the resinous materials therein to perform the function normally accomplished by addition of chemicals to the fiber furnish. Their research led to the discovery that Douglas fir bark present in amounts between 15% and 45% produced acceptable hardboards with no other chemicals added. They also found that although pulp yields were reduced with increases in bark content, freeness remained within required limits for optimum board formation on conventional machines.

These research results were the basis for establishing a process which admitted unbarked slab wood from the sawmill and converted it into hardboard. Dirt and stones are first removed by a water spray and the slabs are then chipped, the over-size chips being re-chipped. The fiberizing operations involve pre-cooking with steam at 300 degrees F. for approximately one minute, grinding in Asplund defibrators, and refining 8% consistency stock in Sprout-Waldron No. 36-2 refiners with further addition of white water to 3% consistency. Before reaching the forming machine, the stock passes consecutively through three 40,000 gallon chests and the consistency is adjusted twice to attain the final 1%. The machine, operating at 20 to 35 feet per minute, converts the low-consistency stock to a wet mat approximately one inch thick for each $\frac{1}{8}$ inch thickness of the finished board.

Following the automatic trim and cut-off saws, another unique feature of the operation is observed in the manner in which the wet mats are automatically transferred to individual cauls and screens. For this operation, a large vacuum head is used which lowers to the conveyor over the mat as it is accurately positioned. With vacuum on, it lifts the mat up while live rolls bring in a screen-covered caul from the opposite direction. The mat is then lowered onto the screen and caul and immediately transported to the press-loading equipment by cross chains and live rolls.

The press cycle is about 10 minutes for $\frac{1}{8}$-inch board and about 15 minutes for $\frac{1}{4}$-inch board at platen temperatures of about 410 degrees F. and pressures up to 750 p.s.i. After pressing, panels are conditioned for three to four hours to about 6% moisture in a "merry-go-round" humidifier. The panels enter the humidifier on edge and are removed after making the complete circuit back to the starting point.

This plant is considered to be modern in the extensive application of electricity to processing and instrumentation. The manufacture of 1000 square feet of $\frac{1}{4}$-inch board is estimated to require 375

"Strangely enough, progress in the hardboard industry has rendered the term 'hardboard' incapable of precise definition because of the many process variations which have been developed."

"Much of the credit for the rapid advances in the hardboard industry is due to the resin manufacturers who have been exceedingly diligent in formulating new resins to meet the peculiar needs of each process."

k.w.h. of electric power. This requires the use of 1500 pounds of slabwood (bone dry basis), 2500 gallons of make-up water, 2500 pounds of steam at 275 p.s.i. and five man-hours of labor.

Chapman Manufacturing Co., Corvallis, Ore.

This plant is the culmination of an effort to reduce the size of installation for economical production of hardboard by the wet process. It was designed to handle about 35 tons of wood per day, producing 1,950,000 square feet of 1/8" board per month. The essential feature of the Chapman process is the 4' x 8' deckle box arrangement for board formation. The process begins with bark-free Douglas fir slab wood delivered by truck from near-by sawmills. The slabs are fed into a chipper and the chips charged into a horizontal pre-heater before feeding into an Asplund Defibrator. From the Asplund, the stock passes through a Bauer refiner and then into a stock chest where the consistency is regulated and the additives are introduced. The principal additives are liquid phenol formaldehyde resin and waxes. The slurry is pumped from the stock chest to a nozzle over the deckle box which sweeps back and forth while automatically depositing the required amount of fiber in the box. As the water drains through the screen in the bottom of the deckle box, paddles maintain agitation and a water spray dissipates foam. The deckle box then lifts and the screen, which is continuous, transports the wet mat to the next step, a pre-press, which squeezes out excess water and reduces the thickness of the mat. After pre-pressing, the mat continues on the screen to the press loader. The mats ride into the press on screens which then assist in removal of water from the mat as heat and pressure are applied.

As in other wet processes, a large part of the water is removed during the hot-pressing operation, some coming off as liquid water and some as steam. Since the boards are reduced to bone-dryness in the press, humidification is necessary to restore the proper equilibrium moisture content. Some boards may receive an oil treatment to improve moisture resistance and increase strength properties.

Superior Wood Products Co., Duluth, Minn.

A modified Chapman wet batch process is employed to produce hardboard from green, sound aspen cordwood. After chipping, the wood is steamed, fiberized in an Asplund Defibrator and refined in Sprout-Waldron refiners. Production capacity is rated at 1,950,000 square feet per month. Products include 1/10" hardboard in addition to the standard 1/8", 3/16" and 1/4" thicknesses. Medium density boards are also produced.

Dry Fiber Processes

Anacortes Veneer Co., Anacortes, Wash.

This plant is the first commercial installation of a process known as the "damp" or "semi-dry" process developed by the Plywood Research Foundation of Tacoma, Washington, a research organization sponsored by the plywood industry. The terms "damp" or "semi-dry" refer to the condition of the fibers at time of felting and pressing. The unique feature of this process is the air-felting of damp, resin-coated fiber into a thick uniform mat. By this means, four drawbacks of the wet processes are eliminated, namely, (1) necessity for a good water supply, (2) expensive water-handling equipment, (3) lengthy press cycles, and (4) waste water disposal problems. The plant is rated at 2,600,000 square feet per month, and utilizes the residues from a Douglas fir plywood mill, such as cores and veneer clippings.

These residues are fed to two different chippers and the chips, after screening, are stored separately in chip bins. Since moisture content of the fiber at time of pressing is one of the most important factors affecting the quality of the finished product, these separate storage bins permit control procedures to be applied early in the process. The two types of chips differ primarily in moisture content and are metered from the bins in the proportion necessary to achieve the desired average moisture content of the stock. The chips proceed to a continuous horizontal Grenco cooker where they receive a steaming treatment under pressure for a limited time. Petrolatum, a special wax to improve the water resistance of the product, is added as the chips pass through the cooker. Two double-disc Bauer mills are used to reduce the chips to fiber with the addition during grinding of a slight amount of water to raise the moisture content to the desired level of dampness. From this point on until felted into a mat, the fibers are conveyed on an air stream. The next operation after grinding, one of great importance in the success of this process, is the thorough distribution of a small amount of liquid, phenol-formaldehyde resin onto the fibers. This is accomplished by spraying the resin into a Grenco blender while the fibers pass through with additional paddle agitation.

From the blender, the fibers discharge to a cyclone separator and then drop to the felting machine which reproduces, in a sense, the action of the wet felting machines. In this case, the fibers are first fluffed with a high speed rotor—which may be likened to reducing the consistency in a water slurry—and thus creating a shower of fibers which cascade onto the floor of the felter. The floor is a continuous rubber belt four feet wide whose speed is regulated to control the thickness of the finished board. The mat at this point is unusual because of its thickness, varying from six to eight inches, and moves immediately to a pre-compressor, a second continuous rubber belt arrangement, which reduces the thickness approximately one half. This improves its handling characteristics and facilitates insertion between the press platens. A traveling saw operating behind the pre-compressor, cuts the mats into eight-foot lengths which then automatically separate and load into the press loader. The loader, designed by American Manufacturing Company, is charged in alternate openings descending and ascending so that when the last opening is filled the loader is aligned with the press for instant charging. A screen carries each mat into the press and remains under the board during pressing to permit escape of steam.

From this point on the operation is similar to conventional wet processes in which pressing is followed by humidification, trimming and inspection. The press cycles, however, are reduced by virtue of the fact that less water is present in the mats to be evaporated by the heated platens.

Coos Bay Lumber Co., Coos Bay, Ore.

The second installation of the Plywood Research Foundation process has recently been put into operation at the Coos Bay Lumber Company. Rated at 9,000,000 square feet per month, this plant has applied the air-felting principle to a drier fiber than is true at Anacortes Veneer Company. Raw materials are the bark-free solid residues from the lumbering operation. These are hand-picked from the main refuse conveyor and sent to a chipper. A screen then separates the fines and oversize pieces from the acceptable chips, the former going to hog fuel and the latter to a single large chip silo. Removed from the bottom of the silo by means of a plate feeder, the chips pass through surge bins and screw feeders to a two-line cooking, fiberizing and resin mixing

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"In the wet forming process, the fourdrinier machine has undergone a natural progression from insulation and wallboard manufacture to hardboard manufacture."

system similar to that employed by the Anacortes Veneer Company. After mixing, heated air is used to convey the waxed and resin-coated fiber to the felter while simultaneously drying it to a moisture content of 8-9%. This relatively low moisture content eliminates the need for a screen during pressing and permits the manufacture of a smooth two-sides board.

The press used in this operation is a 4-foot x 16-foot, 20-opening press. Boards remain as full panels until after the humidification treatment, whereupon they are cut to the desired sizes.

The mat emerges from the felter with the characteristic thickness typical of the air felting method, in this instance varying from three inches to over 16 inches, depending upon the desired thickness of the final board. Board thicknesses include 3/32 inches and 3/8 inches in addition to the standard 1/8, 3/16 and 1/4 inch thicknesses. The 3/32-inch boards are intended primarily for use as an overlay for plywood.

Willamette Fibre Board, Inc., Sweet Home, Ore.

This plant is presently under construction and is expected to be in production late in 1954. Maximum production capacity of the completed plant is reported to be approximately 2,900,000 square feet per month. A dry fiber process will be used to manufacture hardboard from sawmill residues in the area.

Weyerhaeuser Timber Co., Klamath Falls, Ore.

This new fiberboard plant began initial production in 1953 and is scheduled to swing into full production early in 1954. A dry process is employed and several innovations have been announced. The principal source of raw material is white fir, a species heretofore overlooked as a source of fiber for composition boards, and will enter the process in the form of sawmill residues, logging residues and stand-improvement cuttings. The operation is expected to provide a basis for sustained yield management of white fir stands with a 40-year cutting rotation.

The plant will produce 7,500,000 square feet of board per month when operating at full capacity and will include a variety of thicknesses and densities extending beyond the range of conventional hardboard products. The thickness range is from 1/16" to 3/8" and the specific gravity range from 0.32 to 1.23. The surfaces can be made either smooth both sides or smooth one side.

Another departure from conventional fiberboard will be a moldable board which is expected to find wide uses for such applications as auto-body parts, laminates, and facings over various core materials.

Montana Hardboard Co., Missoula, Mont.

This company completed construction of a chipping unit in December, 1953, and will be shipping chips to a pulp mill while installing equipment for the hardboard plant. The Plywood Research Foundation semi-dry process will be used to manufacture approximately 3,500,000 square feet per month at full capacity. Plans for expanding to double this capacity are included in the design of the plant. Initial hardboard production is scheduled for late 1955 or early 1956.

Washington Hardboard Co., South Bend, Wash.

Operating initially as a chipping plant supplying a pulp mill, this installation is now being converted to full-scale production of hardboard. Completion of the plant is estimated for January, 1954. Plant capacity will be approximately 2,000,000 square feet per month and will ultimately be expanded to 8,000,000 square feet per month. Raw materials will be sawmill residues in the area. The operation will be a dry fiber process with air felting as in the Plywood Research Foundation process.

Dry Granular Processes

These processes display the greatest variation in type and size of particles, handling techniques, size of installation and type of product. Products vary from typical hardboard to core boards commonly known as "chipcore." The latter is usually produced in installations tailored to the needs of a parent plant which utilizes its entire production in the manufacture of commodities such as doors and furniture. Several plants produce core boards for the open market and others in pilot plant and planning stages may soon enter this field with the economies attending large-scale production.

Although developmental effort and widespread interest in granular processes pre-dated the recent rapid development of the fiber-based processes, mechanization in the former has lagged behind that of the efficient fiber-handling methods. However, this has been more of a virtue than a drawback because it has permitted a larger number of small installations at locations which have neither the raw materials, capital, nor outlets to justify large production plants.

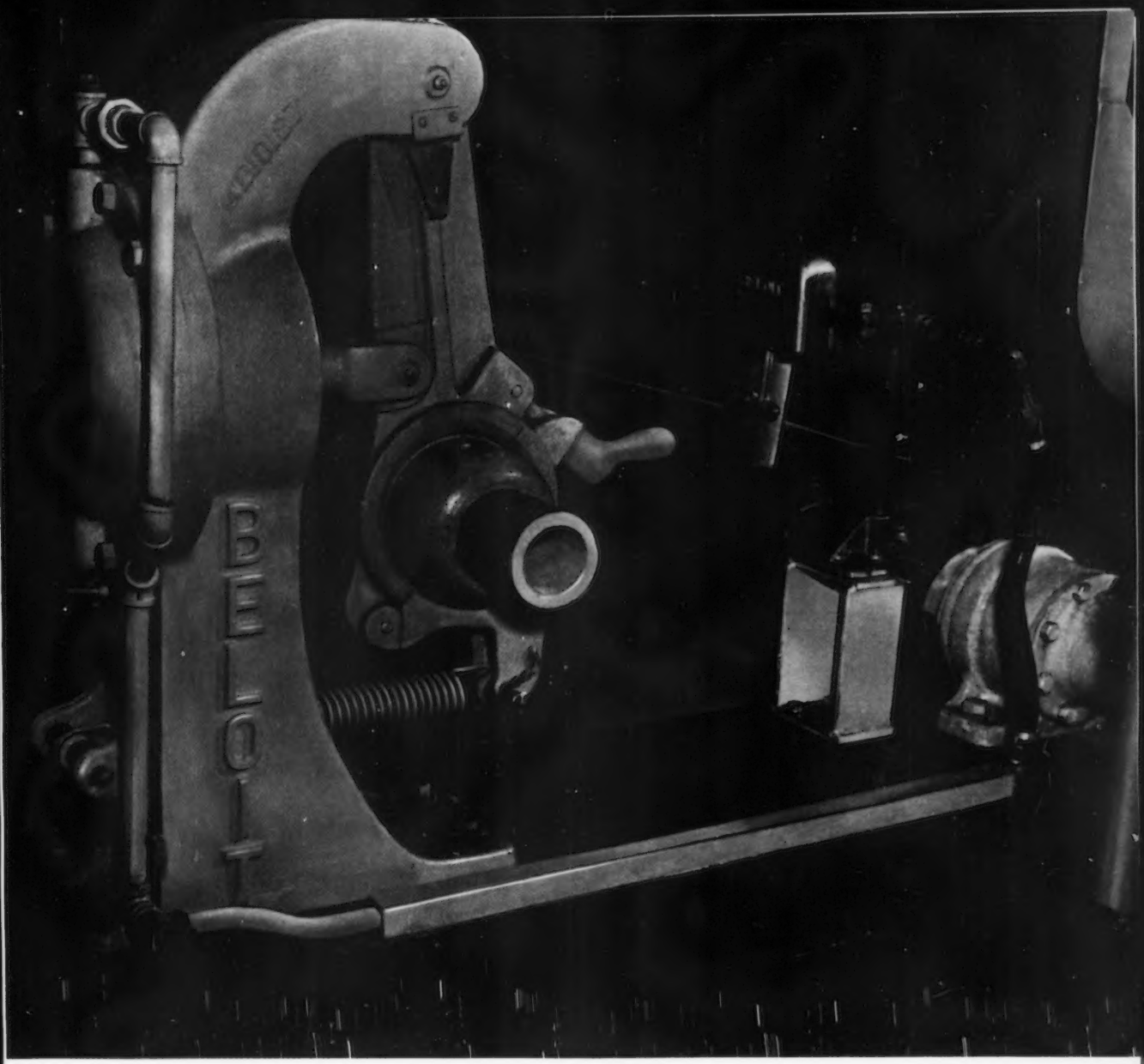
The properties of granular type boards depend largely upon the bonding action of the resin and in this respect differ from the fiber hardboards which are believed to develop a major portion of their strength from mechanical interlacing or fibers and a re-bonding action of the lignin. Granular boards consequently require larger percentages of resin, ranging from 5% to 15% in contrast to 0% to 1.5% used in fiber boards.

Cascades Plywood Corp., Lebanon, Ore.

A new, highly mechanized continuous dry process has been developed and recently put into operation by the Cascades Plywood Corporation. This process converts Douglas fir mill left-overs into a fine granular type of hardboard. Clean, bark-free wood is first converted into chips similar to those used by sulphate pulp mills. Planer shavings may also be used for the raw material. The chips or shavings are processed in a primary hammermill to break them down mechanically into a size suitable for drying. The moisture content of this material is then reduced to 25% in a rotary type dryer. The material is then fed through Uschmann air-flow grinders, which produce a woolly fibrous mass interspersed with granular fines. This operation also reduces the moisture content further to about 10%. A specially developed resin is then thoroughly mixed with the fiber and the mass is passed through a series of three hammermills to attain homogeneity.

A secondary airstream dryer insures that the fibers are within an 8% to 10% range in moisture content as they pass to the Uschmann felter. By ingenious means the fibers are distributed on cauls as they pass through the fiber-laying machine. The granular fines are partially separated from the fluffy fiber mass and a portion of them are distributed on the cauls before the heavier fiber mass is laid. A carry-over of the fines is then distributed on the top of the heavier fibrous mass, which produces a very fine, close-grained surface on each side of the board. The fiber mat is transported on the cauls to a 20-opening hot press which is equipped with a device to close all of the openings simultaneously. After pressing, the boards separate from the cauls and travel by conveyor system through a bank of saws which trim them accurately to a 50" x 100" size. These boards are then ready for warehousing and shipment.

The board has a specific gravity of 1.15 and other properties, including surface smoothness, equivalent to conventional fiber hardboards. Formulation may be varied to include ½ of 1% wax,



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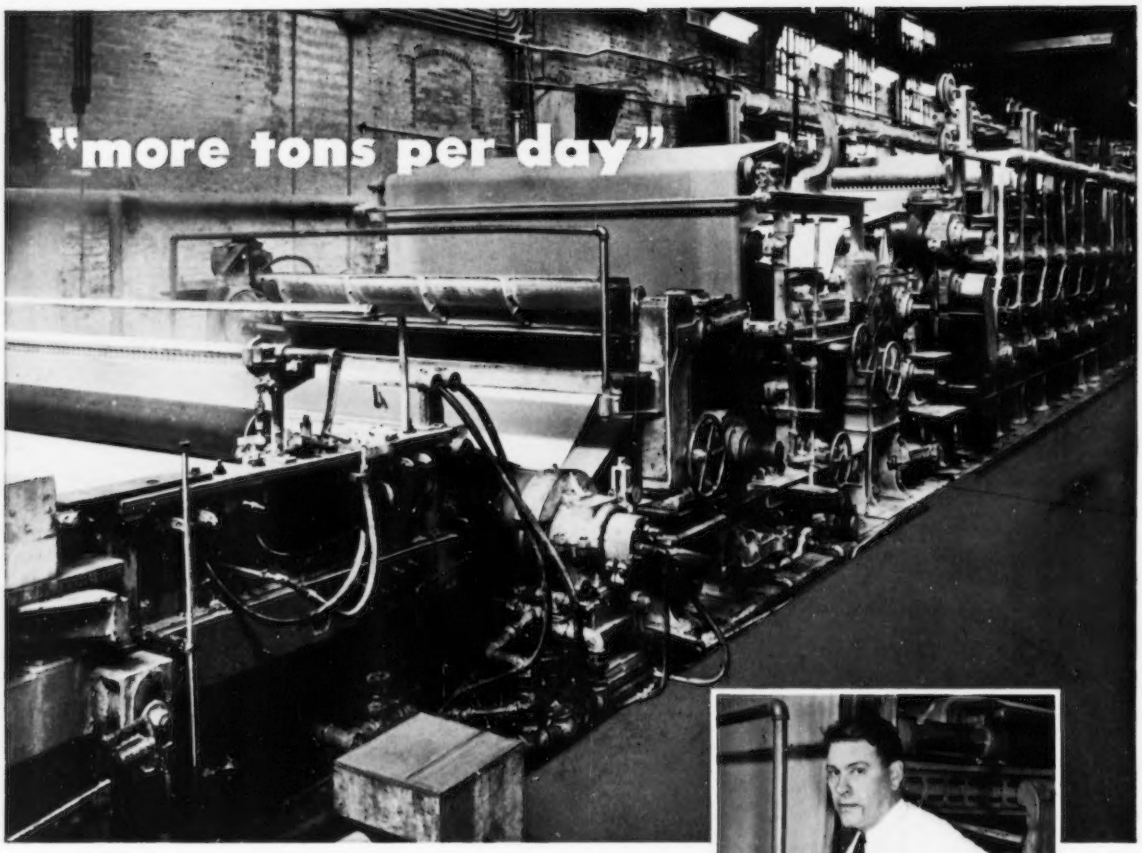

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which reduces the moisture absorption and increases the dimensional stability of the board. Thicknesses other than the standards 1/8, 3/16 and 1/4-inch have been made ranging from 1/16-inch to one inch.

The board is designed for industrial uses and the plant is equipped to cut, route, punch, bore and shape to the customer's specifications.

Rock Island Millwork, Inc., Rock Island, Ill.

Using a typical dry batch process, this company starts with millwork residues, including sawdust and shavings, to produce a hardboard product. Although the process is much simplified and the capacity low in comparison to the conventional fiber hardboards, the product of this process has comparable properties. The first step in the process is one of grinding the residues to a uniform, rather fine, particle size and then thoroughly mixing with a phenolic resin. The mixture is loaded into trays and these are transferred to a 10-opening press. The finished panels may be sanded to precise thickness, cut to size or laminated to greater thickness.

Chipcraft Co., Morristown, Tenn.

In announcing the availability of extrusion machines at comparatively low cost, the Chipcraft Company introduced a new phase of waste utilization in this country. Featuring simplicity, the process yields a "chipcore" type of board suitable for core stock in furniture panels. Densities are in the same range as conventional hardboard, but minimum thicknesses exceed the maximum typical of hardboard.

The process accepts a variety of residues which are first reduced to granular form in a wood hog. The ground material is then screened in a rotary screen, the oversize particles being reground and the accepted particles conveyed to a storage bin. From the bin, the particles are metered into a mixer and there receive a spray application of resin adhesive. After thorough blending, the mixture is automatically metered to the extruding machine where a hydraulic or mechanically operated ram forces it between two heated platens. The space between the platens is adjusted to the desired board thickness. The curing action of the resin is accurately timed so that, upon emerging, the board is ready to handle and pass to the next operation such as overlaying with veneer. An automatic cut-off saw at the delivery end of the extruder cuts panels of the desired length.

The extruding machine may be designed to produce 24-inch or 48-inch wide boards. Machines may also be oriented vertically and with special dies extrude a variety of hollow core shapes. Solid boards from 3/8 inch to one inch and hollow core boards from 3/4 inch to four inches can be made with the same type of machine. Maximum capacity varies from 9,000 to 20,000 square feet of 1/2-inch board per eight-hour day depending upon the size of the machine used.

The first installation of a production machine is at the Berkline Corporation, Morristown, Tennessee, a manufacturer of chairs.

A forerunner of the Chipcraft machine is reported to have been in operation for some time at the Lane Cedar Company,

Processes, Plants and Production Capacities for Hardboard Manufacture in the United States

Processes and Plants	Production Capacity (1) Sq. ft. per month, 1/8" basis
I. FIBER PROCESSES	
a) Wet continuous forming, wet pressing	
Masonite Corp., Laurel, Miss. (1929)	56,900,000
Masonite Corp., Ukiah, Calif. (1951)	31,590,000
Forest Fiber Products Co., Forest Grove, Ore. (1949)	5,200,000
Oregon Lumber Co., Dee, Ore. (1952)	4,680,000
b) Wet continuous forming, dry pressing	
U. S. Gypsum Co., Greenville, Miss.	6,500,000
Oregon Fibre Products, Inc., Pilot Rock, Ore. (1954)	7,800,000
c) Wet batch forming, wet pressing	
Chapman Manufacturing Co., Corvallis, Ore. (1947)	1,950,000
Superior Wood Products, Inc. Duluth, Minn. (1950)	1,950,000
d) Dry continuous forming	
Anacortes Veneer Co., Anacortes Wash. (1952)	2,600,000
Coos Bay Lumber Co., Coos Bay, Ore. (1953)	9,000,000
Weyerhaeuser Timber Co., Klamath Falls, Ore. (1954)	7,500,000
Willamette Fiber Board Co., Sweet Home, Ore. (1954)	2,900,000
Washington Hardboard Co., South Bend, Wash. (1954)	2,000,000
Montana Hardboard Co., Missoula, Mont. (1955)	3,500,000
II. GRANULAR PROCESSES (All dry)	
a) Continuous forming	
Cascades Plywood Corp., Lebanon, Ore. (1953)	3,500,000
b) Batch forming	
Rock Island Millwork, Inc., Rock Island, Ill.	
Souhegan Mills, Inc., Wilton, N. H.	
Plywood Plastics Corp., Hampton, S. C.	
Versatile Products, Inc., Anacortes, Wash. (Pilot plant)	
c) Extrusion	
Chipcraft Co., Morristown, Tenn.	
Dean Co., Chicago, Ill.	
III. FLAKE AND SHRED PROCESSES (All dry)	
Shasta Plywood, Inc., Redding, Calif. (1952)	2,500,000 (3/8")
Long-Bell Lumber Co., Longview, Wash. (1953)	2,900,000
Pack River Lumber Co., Sandpoint, Ida. (Pilot plant)	

[1] From published data and/or letter information. For comparison purposes, conversion of data was standardized to obtain maximum theoretical production capacity based on 26 days per month and 24 hours per day.

Alta Vista, Virginia, where the product is incorporated into cedar chests.

Dean Co., Chicago, Ill.

The Dean Company is now producing extrusion machines patterned after the "Kriebaum" process which has been in operation in Germany for a number of years. The first installation of this process is being made at the Jasper Corporation, Jasper, Indiana. Points of differences between this and the Chipcraft process have not yet been made known.

Flake and Shred Processes

United States Plywood Corp. (Shasta Plywood, Inc., Redding, Calif.)

Using a process developed in Switzerland, this plant manufactures a new type of "laminated" board. It is a three-ply panel consisting of surface layers of thin veneer-like flakes and a core of coarse granular material or chips. The flakes are specially prepared and are applied either as a mixture of pine and fir or all redwood to yield a pleasing decorative effect. The flakes and chips are first coated with a urea resin adhesive and then loaded into trays in three layers, the first layer being flakes, the next chips, and finally another layer of flakes. The trays are then charged into a hot press. Under heat and pressure, the thin outer flakes compress to a smooth surface while the core particles adhere with an open structure and thus maintain a low over-all density for the board. Two thicknesses are produced, $^3/_8$-inch and $^3/_4$-inch, with a specific gravity of about 0.56. Production capacity is about 2,500,000 square feet per month, $^3/_8$-inch basis.

Although differing widely from conventional hardboard, this product is serving successfully in a number of similar uses, such as, cabinet doors, sliding doors, wall paneling, furniture, core material and window displays.

Long-Bell Lumber Co., Longview, Wash.

Pilot plant operations are about to pass into full scale production of a new type of composition board developed by the Long-Bell Lumber Company. Produced by a dry process, the board features a specially prepared veneer-like particle with decorative aspects in addition to high strength and medium density. Typical hardboard is also produced with the same process by segregating the finer fractions. The line of products includes veneer overlays applied simultaneously during the board-pressing operation.

The raw material for this process comes largely from the waste conveyor serving the remanufacturing division. Kiln dried mill ends are shunted to the board plant where they are first reduced to the desired particle with a knife-type cutter and stored in bins by size classification. They are then carried pneumatically to mixers where resins and waxes are added, after which they discharge through a cyclone into the board forming machine.

Pack River Lumber Co., Sandpoint, Idaho

A new process being developed at the Pack River Lumber Company employs a rather large, flat particle or "wafer" produced by special equipment. The operations are still on a pilot plant scale as new techniques of handling and forming are being worked out.

The raw materials for this board are the bark-free slabs from the lumbering operation. These are fed into the cutting machine, the wafers and shreds then screened and the acceptable material passed through a drier. The material is mixed with resins and conveyed to a continuous felting machine which delivers mats to a press loader. The pressed boards are of conventional hardboard thickness, but have decorative value and feature a comparatively low density of about 0.65.

The board is formed continuously in single layer or multi-layer and the 4-feet x 8-feet mats are spread end-wise by differential speed of the conveyor chains beneath the bottom caul. The individual mats then continue over a weighing station and on to the press. Initial production capacity will be approximately 2,900,000 square feet per month, $^1/_8$" basis.

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MORE PEOPLE

(*Continued from page 18*)

Casey Joins H&V

Frank J. Casey, Jr. recently joined the sales staff of Hollingsworth and Vose Co., East Walpole and West Groton, Mass.

Mr. Casey is currently studying the manufacturing processes of the various grades of technical and industrial papers manufactured at the West Groton and East Walpole plants of the company.

Cassidy New Manager For Whiting Paper

Walter J. Cassidy has been named manager of Whiting Paper Co.'s technical paper division.

Mr. Cassidy was formerly associated with the American Writing Paper Corp. and the Hawthorne Paper Co. Before coming to Whiting, he was product development manager with Sorg Paper Co.

Wagner Named V-P Of Eastern Container

Eastern Container Corp., Springfield, Mass., has appoined Joseph W. Wagner vice-president in charge of sales.

Mr. Wagner started with the company more than 11 years ago.

Mr. Wagner previously was employed by General Fibre Box Co. of West Springfield where he worked for a period of approximately 15 years as an operator on one of the machines.

W. G. Mercer Heads Brown's Consumer Products Dept.

William G. Mercer has been named manager of the Consumer Products Department of Brown Co. He will have charge of retail sales of Nibroc towels and toilet tissue, products which Brown Co. plans to introduce in the household market.

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use KOPPERS LATICES

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Styrene-Butadiene Latices

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. . . are unique in heat sensitive adhesives for paper labels.

. . . are ideal as beater additions to pulp in the manufacture of paper and paper products.

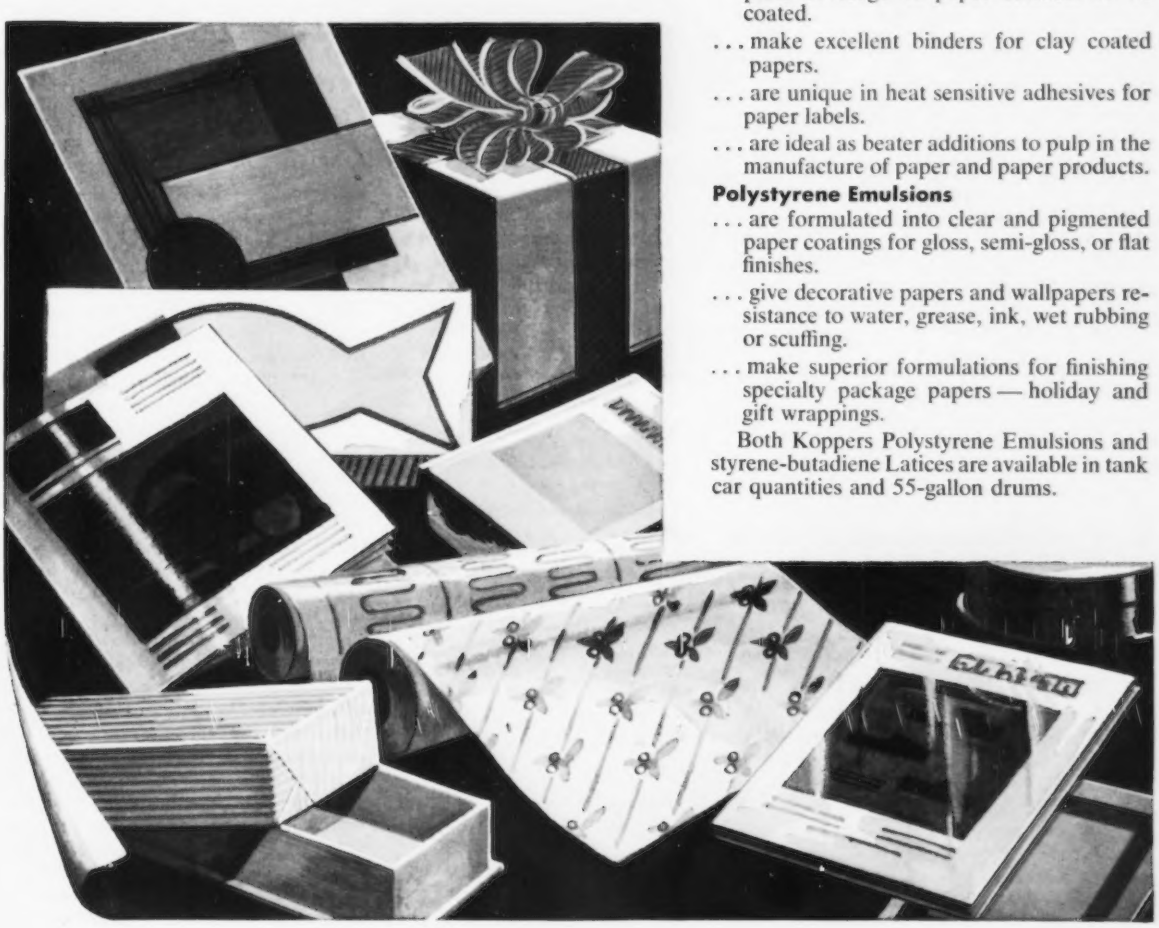
Polystyrene Emulsions

. . . are formulated into clear and pigmented paper coatings for gloss, semi-gloss, or flat finishes.

. . . give decorative papers and wallpapers resistance to water, grease, ink, wet rubbing or scuffing.

. . . make superior formulations for finishing specialty package papers — holiday and gift wrappings.

Both Koppers Polystyrene Emulsions and styrene-butadiene Latices are available in tank car quantities and 55-gallon drums.



Besides Latices, Koppers produces many additional synthetic chemicals, including Resorcinol, Styrene Monomer, Di-tert-butyl-paracresol, Polystyrene, Phthalic Anhydride and Divinylbenzene.

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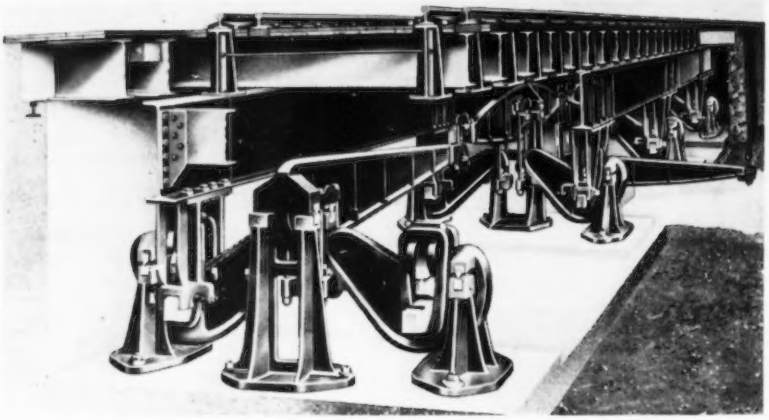
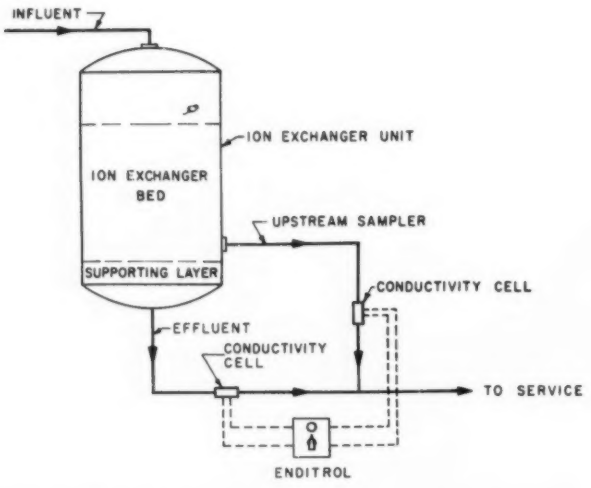


Railroad Track Scales in 25 Standard Models

The Howe Scale Co., Rutland, Vt., is now offering its new Four-Section Straight Lever Railroad Track Scales, available in 25 standard models with capacities in a range from 60 tons per section to 200 tons per section, and in various sizes and lengths.

In addition to the standard models, the scales are available in special sizes and capacities to fit individual requirements. According to the manufacturer, this type scale features a patented wedge adjustment, a platform double-bearing yoke, and interchangeable alloy steel knife edges and bearings. The scales can be equipped with a variety of weight indication and recording instruments. A complete catalog of the new scale line (Form 685) is available on request from the manufacturer.



Control to Signal End of Ion Exchanger Run

An automatic device for indicating the end of the operating run of a hydrogen cation exchanger has been developed by the Permutit Co., 330 West 42nd street, New York 36, N. Y. The device, known as the Enditrol, not only signals the end of a run but also initiates the operation of existing automatic regeneration equipment.

In development of the unit, according to the manufacturer, advantage was taken of the fact that a columnar bed of the ion exchanger, when operated downflow, has its useful exchange capacity exhausted first at the top and that this exhaustion then slowly proceeds downwardly during the operating run, the bottom of the bed being the last portion to become exhausted. In the case of a hydrogen cation exchanger, the calcium, magnesium and sodium cations are taken up from the water passing through the bed and hydrogen ions are given in exchange for them.

During the bulk of the operating run the free mineral acidity of the effluent remains quite constant in amount but on approaching the end of the run, it decreases very rapidly. For most uses, the operating run is terminated when the free mineral acidity falls to 90 percent of what it was during the bulk of the run.

Since decreases in acidity proceed slowly downwardly through the bed during the run, it appeared that, if samples were drawn off at a level somewhat above the bottom of the bed, the differences in acidity between these samples and the final effluent could be used to indicate the end of the run. Therefore, experiments were made with taps inserted in levels at various distances from bottom of the bed. Depending largely on the composition of the water and the specified endpoint of the run, the tap may, in practice, range from about 4 inches to 8 inches above the bottom of the bed.

As shown in the above drawing, a small stream of water, drawn from this tap continuously during the operating run, is passed through a conductivity cell and its conductivity is compared in the Enditrol, with the conductivity of the effluent from the bottom of the exchanger. During the greater part of the run, the conductivities of both the upstream sample and the final effluent are nearly identical, so the ratio of the conductivity of the final effluent to that of the upstream sample is equal to approximately 1.0. But since hydrogen ions have an appreciably higher conductivity than the metallic ions, calcium, magnesium and sodium which they have replaced, the effluent, near the end of the operating run, has a higher conductivity than the upstream sample taken from the tap. Depending on the position of the upstream tap the ratio of the conductivity of the effluent to that of the upstream sample may range from 1.2 to as much as 3.0.

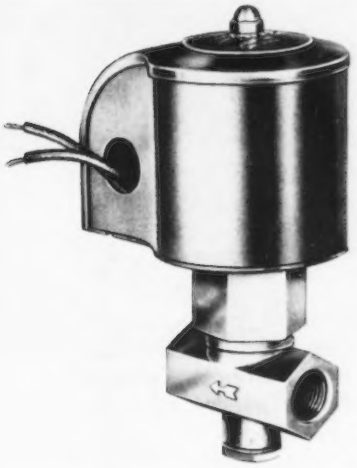
As the new control operates not on the conductivity of the effluent but on the ratio of the conductivity of the effluent to that of the upstream sample, it is stated that waters of variable composition may be handled as accurately as waters of constant composition.

The unit may be equipped with a relay so that it signals the end of the operating run by an alarm bell or light

or with electrical controls so that the operation of the ion exchange unit is made completely automatic.

According to the manufacturer, this control is also applicable to the operation of anion exchanger units, especially in the operation of strongly basic anion exchangers in demineralizing installations where silica removal is of importance.

In such demineralizing installations, of either the "two-step" or "mixed bed type," the effluent conductivity does not change appreciably at the time that silica begins to slip through into the effluent. Thus the usual conductivity determinations made on the demineralizer effluent do indicate if the run should be terminated because of the presence of excessive dissolved silica, it is said.



Packless Valve For Corrosive Fluids

Special 8268 Solenoid Valve is a variation of a standard two-way valve line, made suitable for handling corrosive gases and liquids as well as steam. The valve is made by Automatic Switch Co., 391 Lakeside Ave., Orange, N. J.

It is said that the valve with stand operating temperatures up to 450 degrees F. Its body is supplied in either steel or stainless steel. All trim is stainless numbers 303, 317, and 430 F. stainless are standard, but other types may be ordered.

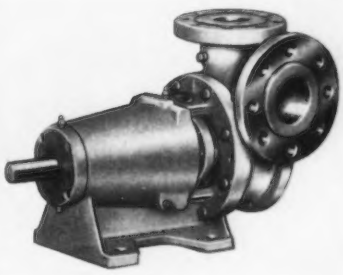
The valve is equipped with beveled stainless steel regrindable or replaceable discs. It is packless with no sliding glands or stuffing boxes, and is designed to open when the solenoid is energized and snap-closed when it is de-energized.

Laminated or solid cores are available. Pipe sizes are $\frac{3}{8}$ and $\frac{1}{2}$ inch, and orifice diameters range from $\frac{1}{8}$ to $\frac{3}{8}$ on each size. Manual operators can be supplied on all sizes except those with a $\frac{1}{8}$-inch orifice.

Self-Cleaning Slurry Regulator

W. A. Kates Co., 430 Waukegan Rd., Deerfield, Ill., is now producing a 275 g.p.m. capacity regulator especially designed to control flow rates of liquids and light slurries. The unit is known as Model 7 SA. Its capacity ranges from 50 to 275 g.p.m.

The regulator measures 13 inches in diameter and 30 inches high, and is equipped with 4-inch pipe connections. The manufacturer states that this regulator and others in the same series are self-cleaning, free from time lags, and able to handle a broad range of materials including hot tar solutions.



End-Mounted Chemical Pumps

Roth Series 21 and 22 chemical pumps are end-mounted units now available from Roy E. Roth Co., 2420 Fourth Ave., Rock Island, Ill. The pumps are single stage, side suction, based on the turbine vaned-impeller design, and built for chemical service with acids, caustic solutions, liquefied gases, and solvents, it is said.

This type pump utilizes a combination of centrifugal and shearing forces to develop pressures up to 300 p.s.i. in a single stage. The manufacturer explains that the impeller runs free from metallic contact with the casing but at very close clearances, thus permitting delivery of high pressures at medium and low capacities.

The pumps are suitable for speeds up to 4000 r.p.m. and can be furnished in bronze fitted or standard fitted construction for handling boiler feed water up to 250 p.s.i. and 300 degrees F.

Extra Lift Height Can Be Added to Fork Trucks

Lewis-Shepard Products, Inc., Watertown, Mass., recently developed the L-S Compound Carriage for use with its Spacemaster electric fork lift trucks. This device is said to add 14 inches extra lift with no increase in the collapsed height of the truck. The capacity of the truck remains approximately the same with only a 3-inch extension of the loadcenter.

The new unit consists essentially of an extra short mast section and an extra carriage. The short mast is welded to the normal lifting carriage, and the extra carriage (containing the forks) rides on rollers within the new mast section. At the start of the lifting cycle, the center ram first lifts the extra carriage and forks to the top of the new mast section; then it and the outboard rams continue to rise, lifting the forks to a height of 14 inches above the former maximum elevation.

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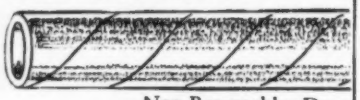

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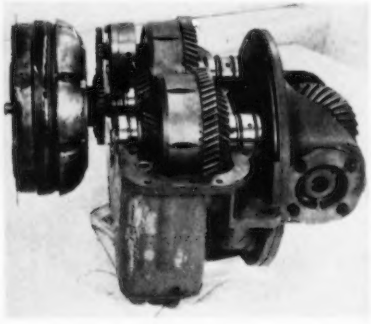
Gasoline Tractor To Pull Dolly Train

A new four-wheel Banty gasoline tractor, Model 460, for use in the trackless train system of material handling, has been developed by Mercury Mfg. Co., 4044 S. Halsted St., Chicago 9, Ill. Two models of the tractor are available. The standard model is rated at 2,300-pound maximum drawbar pull and the heavy duty model at 3,000-pound maximum drawbar pull. The tractor has an outside turning radius of 62 in., and a centrally-located inclined Ross cam and twin lever steering gear, fitted with an automotive steering wheel. The power plant is a four cylinder Waukesha engine, with a selective synchro-mesh transmission of three speeds forward and one reverse. The final drive and transmission gearing operate in an oil bath. All other bearings are provided with Alemite fittings. Brakes are internal expanding, self-energizing hydraulic type within the drive wheels (foot pedal controlled).



Clutchless Drive for Gas-Powered Fork Trucks

Gas-powered Clark Carloader-model fork trucks in 3000-5000 pound capacities are now available with Hydratork Drive shown above. It is a transmission which does away with the need for a gear shift, high and low gears and a clutch and clutch pedal, and is a development of Clark Equipment Co., Battle Creek, Mich.

The drive, which combines a torque converter with a simple constant-mesh transmission, makes it possible to operate a gas-powered fork-truck with three simple controls, an accelerator, a brake pedal and a forward-reverse selector lever located on the steering column.

One of its advantages is said to be that it eliminates gear clashing during engagement, resulting in reduced maintenance requirements. Other advantages cited are smooth acceleration, positive drive control at all times, less driver fatigue and controlled "inching" ability.

Steam Traced Aluminum Pipe, Integrally Extruded

Said to offer natural corrosive resistance, improved heat transfer, and savings in material and insulation, integrally extruded steam traced aluminum pipe is now available from the Aluminum Co. of America, 720 Alcoa Bldg., Pittsburgh 19, Pa. Extruded as a single unit from Alcoa 3 S-F aluminum alloy, the pipe is known as unitrace and is recommended for carrying such sluggish products as molten sulphur.

The new pipe is slightly oval because of the crescent shaped steam passage adjacent to the product line. It is presently available in standard 2-inch pipe size without die charge. This size is designed so that insulation for 2½-inch standard pipe will form around it naturally, although the heat transfer efficiency of this pipe eliminates need for thermal insulation in many applications, it is said.

The maker also states that this piping lends itself to shop fabrication of standard lengths and can be formed easily with conduit tools. Pipe lengths may be joined by simple weld either with or without jumpers to carry the steam across the joints, or dismountable unions can be made with welded pipe fittings and steam jumpers.

Solenoid Lift Valve

A new stainless steel Solenoid Direct Lift Valve in $\frac{1}{8}$-inch and $\frac{1}{4}$-inch pipe sizes and said to have high corrosive resistance, is available from Atkomatic Valve Co., Dept. B232, 545 Abbott St., Indianapolis, Ind. Valve bodies are constructed of 303 stainless steel, solenoid armature is 416 stainless.

Valve pressures are listed as 5000 p.s.i. to 150° F. maximum, and 2500 p.s.i. to 400° F. maximum. Orifice sizes range from 1/16-inch to 3/16-inch diameter depending on pressure requirements and coil used.

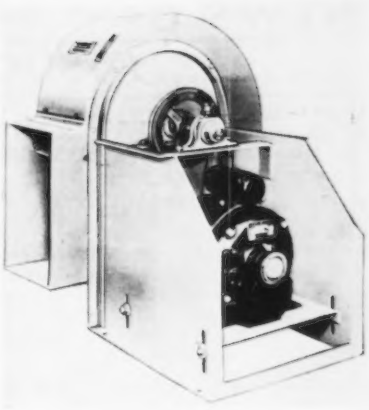
Paper wound or glass impregnated coils are used depending on temperature range. For use on temperatures in excess of 180° F., glass wound, silicone impregnated coils are recommended.

Coils used on normal pressures ranges are single wound, higher pressures use double wound coils with two separate windings, an extremely strong primary winding for initial pull-off and a normal winding for holding the armature in the coil field during operation. Technical literature is contained in bulletin No. 100, available from the manufacturer.

Improved Valve Diaphragm Of Non-Corrosive Plastic

M. W. Kellogg Co., Chemical Mfg. Div., P. O. Box 469, Jersey City, 3, N. J., is now supplying plasticized Kel-F plastic diaphragms for corrosion-resistant service in Grinnell Saunders-type valves of $\frac{1}{2}$-inch to 8-inch capacity. The diaphragms are molded with imbedded metal studs by Chicago Die Mold Div., U. S. Rubber Co.

It is said that these diaphragms remain inert to practically all chemical materials, even at elevated temperatures. Because the plastic material is plasticized with polymer oils that resist leaching, it is said to retain its flexibility up to 100,000 cycles. It is further stated that these diaphragms retain their dimensional stability at temperatures to 300 degrees F. and at pressures up to 150 p.s.i. The low "cold flow" properties of the material allow it to act as its own gasket.



Exhaust Fan Sets For Corrosive Service

Two lines of exhaust blowers protected for corrosion and abrasion service have been placed in production by Heil Process Equipment Corp., 12901 Elmwood Ave., Cleveland 11, Ohio.

One line is a self-contained, coated fan set (shown above) that is designed for services from simple ventilating to handling moderately corrosive atmospheres. In the latter service, the sets are supplied with either baked phenolic, vinyl, or latex coatings. They are available in capacities from 300 to 7000 c.f.m.

The other line is a series of rubber-covered blowers for severe corrosion or abrasion duty. These are made in capacities from 750 to 54,000 c.f.m. The fans are paddle-type design, dynamically balanced, and said to maintain suction at the hoods irregardless of varying static losses in the over-all system.

Designed to Trim your Trimming Costs!

86" Model E. Undercut Trimmer showing side loading table. Loading table and air for floating pile are optional equipment.
SMITH & WINCHESTER
MODEL E
UNDERCUT TRIMMER
with Side Loading Table

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The S & W Model E Undercut Trimmer meets the needs of the modern finishing department for high production, accuracy and safe operation. For years the Standard Undercut Trimmer and the Model E have been giving outstanding service in the leading plants of the country.

Now, we offer the Model E with side loading table and air for floating pile, for fast, straight line operation, ease of handling stock and increased efficiency. The Model E is built in 56", 66", 76" and 86" widths.

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The SMITH & WINCHESTER *Manufacturing Company*
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NEWS OF ASSOCIATIONS

Superintendents Meeting Dates

DATE	DIVISION	PLACE
Apr. 20	Miami Valley Div.	American Legion Hall, Middletown, Ohio
May 6-7	Northwestern Div.	Leamington Hotel, Minneapolis, Minn.
May 14-15	Penjerdel, Spring Meeting	Yorktowne Hotel, York, Pa.
May 20-21	Pacific Coast Joint TAPPI	Gearhart Hotel Gearhart, Ore.
Sept. 2-4	New York-Canadian	Saranac Inn Saranac Inn, N. Y.
Sept. 23-25	Northeastern Div.	Poland Spring House Poland Spring, Maine

TAPPI Meeting Dates

DATE	DIVISION	PLACE
Apr. 8	Ohio	Plant Tour—National Starch, Indianapolis, Ind.
Apr. 13	Lake States	Forest Products Laboratory, Madison, Wis.
Apr. 13	Metropolitan District Empire State	Fraunces Tavern Pearl & Broad Sts. New York City
Apr. 14	Western District Empire State	Washington Rm., Park Hotel, Lockport, N. Y.
Apr. 16	Lake Erie	Carter Hotel, Cleveland, Ohio
Apr. 19	Chicago	Chicago Bar Assn. Chicago, Ill.
Apr. 22	Delaware Valley	Engineers Club 1317 Spruce Street, Philadelphia, Pa.
Apr. 22	Eastern District Empire State	Milfranks Restaurant Glens Falls, N. Y.
May 6	Kalamazoo Valley Section	Hotel Harris, Kalamazoo, Mich.
May 7	Central District Empire State	University Club, 431 E. Fayette St., Syracuse, N. Y.
May 14-15	Southeastern	Hotel De Soto, Savannah, Ga.

Eastern District Discusses Pulp Evaluation

Pulp evaluation was discussed by a panel of members of the Eastern District of the Empire State Section of TAPPI at the regular meeting at Milfranks, March 18. Members of the panel, and the committee which laid the way for the accumulation of material, represented paper mills from Mechanicville to Plattsburg.

A wide range of standard and substitute tests for pulp of all kinds was discussed by a panel of which the moderator was C. N. Hagar, Diamond Match Co., Plattsburg. Some new tests were suggested and new applications of old tests discussed.

The preparatory work for the discussion was done by a committee consisting of Mr. Cole, chairman, and W. H. Howell, New York and Pennsylvania Co., Willsboro; Harold Field, West Virginia Pulp and Paper Co., Mechanicville; Clyde Davis, Finch Pruyn Co., Glens Falls; and James Rogers II, J. and J. Rogers Co., AuSable Forks.

The speakers on the panel were Dr. Johnson; Hugh Lavery, International Paper Co., Palmer; Paul Page, Imperial Wall Paper and Color Co., Plattsburg and J. W. Dappen, Marinette Paper Co., Fort Edward.

Mr. Cole, vice-chairman of the district, presided, introduced by J. W. Crocker, chief engineer, The Sandy Hill Iron & Brass Works, Hudson Falls.

The regular April meeting will be held April 22, the fourth Thursday instead of the third. The May meeting, to which the members may invite lady guests, will be held May 19.

Dr. Earl H. Johnson, chairman of the Empire State award contest announced that there will be four papers presented by the entrants in the contest. The judges for the contest will be Robert Blakeslee, Imperial Wall Paper and Color Co., Glens Falls; Grant Cole, Diamond Match Co., Plattsburg; and Dallam Blandy, American Wood Board Co., Schuylerville.

The spring meeting of the Empire State section will be held at the Whiteface Inn, Saranac Lake, June 10, 11 and 12.

CHAS. T. MAIN, INC.
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NEW LITERATURE

Demineralizing Units. (Bulletin DM) Provides flow diagrams and description of five types for total demineralization and three for partial demineralization. Also includes engineering drawings of slat type and diffusion tube type degasifiers. Hungerford & Terry, Inc., 226 Atlantic Ave., Clayton, N. J.

Equipment for Distillation, Absorption and Extraction. (Booklet) Discusses custom-engineered columns, exchangers, reboilers, auxiliaries and controls. Also contains photos, operational and design text on more than a dozen products. Colonial Iron Works Co., 17643 St. Clair Avenue, Cleveland 10, Ohio.

B. F. Goodrich Elevator Belting. (Engineering Handbook) Describes and illustrates types of belt bucket elevators; gives factors for belt section; outlines procedures for engineering for correct belt and describes belt construction features. Also includes suggested specifications for listing required engineering information. B. F. Goodrich Co., 448 S. Main Street, Akron, Ohio.

H. & T. Condensate De-Oiling Filter System. (Bulletin D-F) Shows flow diagram of de-oiling filter system and interior view of de-oiling filter unit, surface agitator type. Also contains information on washing, precoating, chemical requirements and partial list of users, including Rex Paper Co. Hungerford & Terry, Inc., 226 Atlantic Avenue, Clayton, N. J.

Hydrabeater By Shartle (Bulletin 16-SB) Discusses design and operation of combination pulper-refiner as well as various methods of controlling refining action. Also includes set of pulping standards, curve sheets showing results of test run, sizes, capacities and dimension of Hydrabeater and new Hydraslusher. Shartle Bros. Machine Co., Div. Black-Clawson Co., 605 Clark Street, Middletown, Ohio.

Drying of Paper in the Paper Making Process. (Booklet) By A. E. Montgomery, vice-president, J. O. Ross Engineering Corp., who, through his experiences and reflections of many years as a specialist in heating and ventilating, has handled this important subject in an exceptionally clear and readable style. Also, through the courtesy of TAPPI, as an Appendix, this includes reproductions of all TAPPI Data Sheets relating to drying rates for various papers. Of particular help in determining whether the drying rate of a paper machine is all that should be expected. Price $1.00. Obtainable from William L. Barrell Co., 52 Chauncy street, Boston, Mass.

Fiberglas Products for Papermaking. (21 p. Booklet) Presents information on types of Fiberglas fibers useful in field of papermaking, and on their product and processing characteristics. Suggests applications for papers containing Fiberglas and summarizes present experience in sheetmaking techniques. Much of the work on which this brochure has been based is exploratory in nature but should prove helpful in developing methods and applications beyond the scope of those suggested. Owens-Corning Fiberglas Corp., 16 E. 56th street, New York 22, N. Y.

Farval Centralized Systems of Lubrication. (Bulletin-1954) Contains illustrated sales copy on six studies in centralized lubrication. Farval Corp., 3293 E. 80th street, Cleveland 4, Ohio.

Inversand Zeolite Water Softeners. (Bulletin 1S-1) Covers construction details and principles of operation. Also includes cut-away photograph of typical Inversand water softener and photographs of installations. Hungerford & Terry, Inc., 226 Atlantic Avenue, Clayton, N. J.

Multiple-Generator Sectional Drives for Paper Machines. (Bulletin GEA-5712A) Points out flexible versatility of sectional drives by providing information on installation, operation, maintenance, adaptability, and service. Also covers other types of G-E paper machine drives. General Electric Co., One River Road, Schenectady 5, N. Y.

Naylor Light-Weight Pipe. (Bulletin 507) Shows typical applications of lightweight lockseam-spiralweld pipe and fittings. Also includes specifications, together with data on fabricated fittings, flanges and connections to meet all pipe line requirements. Naylor Pipe Co., 1230 E. 92nd street, Chicago 19, Ill.

The Airchek Valve. (Bulletin 509) Lists nine reasons why Airchek deserves a place in compressor installations. Also includes cross sectional drawing, and pictures of typical compressor installation with Airchek installed in discharge line, as well as air cushion valve disassembled. Pennsylvania Pump and Compressor Co., Bushkill Drive, Easton, Pa.

Ajax Dihedral Floating Shaft Couplings. (Bulletin 53) Provides engineering drawings showing couplings installed with live halves mounted on floating shaft, as well as driving and driven shafts; photograph of installation on pulp mill in Oswego Falls Corp., Fulton, N. Y.; specifications for standard forged steel floating shaft couplings; offset or parallel misalignment capacity; drawing showing successive positions of a single tooth under misalignment during one complete rotation of coupling, and service factors. Ajax Flexible Coupling Co., Inc., English & Portage streets, Westfield, N. Y.

B&W Heat Exchanger and Condenser Tubes, Seamless and Welded. (Bulletin TB-329A) Lists analyses and mechanical properties of 29 carbon, alloy and stainless tubing steels. Also presents data on reference specifications and applications. Tubular Products Div., Babcock & Wilcox Co., Beaver Falls, Pa.

Cleveland Worm Gear Speed Reducers. (Catalog 400) Covers entire worm gear speed reducer line, including details of service on special designs. Cleveland Worm & Gear Co., 3297 E. 80th street, Cleveland 4, Ohio.

Ryerson Ryertex Plastics. (16p. Bulletin) Provides data on the manufacture, grades, properties, fabrication and use of laminated plastic sheets, tubes, rods, and special shapes. Also includes table of average characteristics and properties, information on Ryertex installations in the paper industry and examples of installations. Ryertex Plastics Div., Joseph T. Ryerson & Son, Inc., P. O. Box 8000-A, Chicago 80, Ill.

Roth End-Mounted Chemical Pumps. (Catalogue-Section 100) Deals with special designs of regenerative turbine pumps for chemical service. Also contains survey and evaluation of a variety of mechanical seals available in turbine chemical pumps. Roy E. Roth Co., 2420 4th Avenue, Rock Island, Ill.

Remote Liquid Level Indicators. (Yarway Bulletin WG-1824) Presents complete description of Remote Liquid Level Indicators, application and installation information, recommendations and wiring diagrams. Yarnall-Waring Co., Chestnut Hill, Philadelphia 18, Pa.

Saunders Valve-Series 800 Diaphragm Motor Valves. (Specification Sheet 410-2) Describes pinchcock design that assures tight shut-off of slurries, viscous or volatile substances. Also provides engineering drawings of four different types. Minneapolis-Honeywell Regulator Co., Industrial Div., Wayne & Windrim Avenues, Philadelphia 44, Pa.

NEWS OF SUPPLIERS

A. R. Boyd

F. P. Knack

W. D. Stroud

● F. C. HUYCK & SONS, Rensselaer, N. Y. has promoted Frank P. Knack, Alan R. Boyd and W. D. Stroud, former sales representatives, to the position of District Manager. These gentlemen are true veterans of the felt and paper industries, having an aggregate of 87 years' experience, all of it with the Huyck company. The new assignments will permit them to continue their long associations with mill men in their present territories. In addition, they will direct the field activities of the Huyck service, development, manufacturing and research representatives in their respective districts.

Mr. Knack will be Manager of the Mid-west District. He joined F. C. Huyck & Sons in 1923. For many years he has served the paper and paperboard mills in the southern states as well as in Illinois, Ohio, Michigan, Iowa, Kansas, Oklahoma, Colorado, Missouri and Indiana. Mr. Knack makes his home in Geneva, Ill.

District Manager of the Middle-Atlantic States will be Alan R. Boyd. He became affiliated with F. C. Huyck & Sons in 1929, was a Service Engineer until 1930, and has been Sales Representative since that time. Widely known in the industry, Mr. Boyd is very active in the Pulp and Paper Mill Superintendents Assn., TAPPI and social groups related to paper mill activities. He lives in Wyndmoor, Pa.

W. D. (Dick) Stroud has been appointed New England District Manager. He first became associated with the paper industry in 1920 as a research chemist for Laurentide Co., now Consolidated Paper Co., in Grand Mere, Quebec. In 1923, he joined F. C. Huyck & Sons as a Sales Representative and has continued in that capacity until his recent promotion. During this period he represented Huyck in Maine, Massachusetts, Connecticut, New Hampshire and Rhode Island. Mr. Stroud resides at Falmouth Foreside, Maine.

● HOOKER ELECTROCHEMICAL CO., Niagara Falls, announces the following promotions on the company's sales staff.

Harold A. Wever who entered Hooker's employ in 1943, is now a field salesman with headquarters in Chicago. Mr. Wever has been connected with the research operation and development departments and did technical sales service work in the field.

Julian J. Boyce who has most recently been in the sales office at Niagara Falls, has been made a field salesman, with headquarters in the Philadelphia area. Mr. Boyce has been in the process study department and later was assistant maintenance engineer in the plant which Hooker operated for the Chemical Corps.

Ernest F. Blew has become a field salesman with Headquarters in New York. Mr. Blew was a chemical engineer in the process study department.

Charles A. Strack replaces Mr. Blew in field technical sales service work. He will work at headquarters in Niagara Falls.

● DORR CO., Engineers, Stamford, Conn., has appointed William E. Smith assistant sales manager, with headquarters in Stamford. Glenn O. Wilson, previously manager of the Western Industrial Division in Denver, is moving to Stamford and will manage North American Industrial Sales. William T. Marston takes over Mr. Wilson's former position as manager of the Western Industrial Division, with headquarters in Denver.

J. W. Hurley

W. G. Dahlquist

● A. E. STALEY MANUFACTURING Co., corn and soybean processor, have made the following personnel changes in the Industrial Sales Department.

William G. Dahlquist, a member of the Staley company's Chicago sales staff since 1951, has been named manager of the chemical division.

James W. Hurley, who has been with the company the past 13 years, has been appointed manager of marketing plans for the chemical division. Mr. Hurley has been in charge of market research and customer service in the Industrial Sales department.

Succeeding Mr. Hurley in charge of market research and customer service section is C. W. White, who has been manager of the company's service department. Wendell Ray, a member of the Philadelphia sales staff, has replaced Mr. Dahlquist at Chicago, and Henry Platzbecker, trainee and order clerk in the Decatur office, has been assigned to Philadelphia.

PRICES OF MATERIALS

Aluminum sulphate:			
cml. bags, c.l. wks.	cwt.	$1.85	/ —
iron-free, c.l. wks.	cwt.	3.55	/ —
Casein, acid prec.:			
dom. sh. pt. c.l.	lb.	.25	/ .32
Arg. ex dock, duty paid		.20	/ .21
New Zeal. do		.23	/ .25
Caustic soda:			
c.l. wks. solid, 76%	cwt.	3.70	/ —
flak. & grd. 400-lb. drums, c.l.		4.10	/ —
liquid 50% tanks		2.55	
liquid 70% tanks		2.65	
China clay:			
dom. air-float, c.l. wks.	ton	10.00	
water-washed, lump, filler	ton	11.00	
coating	ton	17.60	/30.50
Imported, ex. ship	short ton	16.00	/30.00
Chlorine:			
single-unit tanks, works	cwt.	2.93	/ —
multiple unit, 2-5 cars per yr.		3.83	/ 5.00
Formaldehyde:			
USP, inh. dms. c.l. wks.	lb.	.0666/	—
l.c.l., E. wks.	lb.	.071	/ —
Lime:			
hydrated bags, wks.	tons	14.50	/15.50
Gum rosin:			
K, M, N, drms, c.l. Savan, cwt.		7.55	/ 7.60
Rosin size:			
70%, gum & pale grds., tank cars, south, sh. pt.	cwt.	6.60	/ 6.65
Salt cake:			
dom. bulk, c.l. wks.	ton	19.00	/ —
Soda ash:			
light, 58%, bags, wks.	cwt.	1.65	
bulk	cwt.	1.35	
Sodium silicate, 40° Be.:			
tank-cars, wks.	cwt.	1.00	/ —
drums, c.l. wks.	cwt.	1.35	/ —
42° Be. WW,			
tank-cars, wks.	cwt.	1.60	/ —
drums, c.l. wks.	cwt.	1.95	/ —
Sodium peroxide:			
dms. c.l. E. of Miss.	lb.	.186	
l.c.l. do	lb.	.191	/ .201
Soybean, protein:			
chem. isol., wks. c.l. bags	lb.	.25	/ .25½
Sulphuric acid:			
60° Be. chys. c.l. wks.	cwt.	1.75	/ 2.00
l.c.l. wks.	cwt.	2.30	/ 2.45
tank-cars, wks.	ton	16.30	/18.60
Sulphur:			
crude, c.l. mines, contract,	long ton	25.50	/27.50
f.o.b. vessels Gulf	do.	27.50	/30.50
Sulphur dioxide:			
liquid, coml. cyl., wks.	lb.	.09	
multi-unit cars	lb.	.0535	
Starches:			
corn, multiwalls, c.l. prod. plant:			
pearl	cwt.	6.39	/ —
white, dextrines	cwt.	7.78	/ —
chlorinated	cwt.	8.14	/ —
potato, Idaho, c.l. wks. W.	cwt.	6.50	/ —
East, fr. all. 50 cents cwt.			
potato, Maine, f.o.b. wks.	cwt.	nominal	
Talc:			
domestic, sacks, c.l. wks.	ton	25.00	/30.00
Titanium dioxide:			
anatase, c.l. deld. E. bags	lb.	.22½/	.23
l.c.l. deld.	lb.	.23½/	.24
rutile, c.l. deld.	lb.	.24½/	.25
l.c.l. deld.	lb.	.25½/	.26

AMERICAN PAPER AND PULP ASSOCIATION'S PAPER PRODUCTION RATIO REPORT

(Production as per cent of normal capacity)

COMPARATIVE WEEKLY SUMMARIES

1954	Feb. 20 94.6	Feb. 27 94.7	Mar. 6 94.0	Mar. 13 93.1r	Mar. 20 94.2
1953	Feb. 21 94.4	Feb. 28 94.6	Mar. 7 93.2	Mar. 14 95.1	Mar. 21 95.2

COMPARATIVE MONTHLY SUMMARIES

Year	Jan.	Feb.	Mar.	Apr	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1953	94.5	94.6	94.4	92.7	93.9	93.8	82.2	94.7	92.7	97.2	94.6	82.8	92.3
1954	94.2‡	94.5‡											

COMPARATIVE YEARLY SUMMARIES

	1947	1948	1949	1950	1951	1952	1953	1954
Year to Date	105.2	100.5	92.6	95.0	100.1	97.4	95.0	94.2
Year Average	101.7	92.1	83.7	95.8	98.0	88.6	92.3	

‡ Preliminary.
r Revised.

PAPERBOARD OPERATING RATIOS†

1954	Feb. 20 89	Feb. 27 88	Mar. 6 88	Mar. 13 91	Mar. 20 92	
1953	Feb. 21 94	Feb. 28 95	Mar. 7 96	Mar. 14 94	Mar. 21 95	

Year	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Year Avg.
1953	91	95	95	95	96	93	81	98	94	97	94	79	93
1954	89	89											

All of the above data is based on tonnage reported to American Paper and Pulp Association. Does not include mills reporting to National Paperboard Association, except in isolated cases where both paper and paperboard are produced and separate tonnage figures are not readily available. Does not include mills producing newsprint exclusively.

Note: In the above tables *all* the ratios shown are on the basis of a normal 6 and 7 day capacity.

† Per cents of operation based on "Inch-Hours" reported on a 6-day basis to the National Paperboard Association.

Pure zinc or aluminum, molten-sprayed on iron or steel surfaces, provides complete, dependable protection against atmospheric corrosion for upwards of 20 years without further maintenance. Such coatings are *mechanically* bonded to the surface—adhesion is *not* dependent on volatile vehicles or binders. Scaling, crazing, blisters, are eliminated. Protection is positive. "Metallize 'em and forget 'em!"

Why not find out more about how you can forget rust for 20 years or more? For descriptive Bulletin 62B—or the name of your nearest Metco Systems contractor—write or wire.

**Reg. U.S. Pat. Off.*

the Metco* Systems
—a series of 18 basic engineering specifications developed over 19 years of experience with pure zinc and aluminum coatings on many different types of structures and equipment. The *Metco Systems* provide for standardization of surface preparation, metal coating thicknesses and organic aftercoatings for various service conditions and appearance requirements.

Metco Systems Dept. PJ, 38-14 30th Street Long Island City 1, New York

PRICES

MARKET WOOD PULP

Second Quarter Contract Prices Per Short Air-Dry Ton

	Delivered Basis		Varying Freight Allowances		
	U.S.	Canadian	Swedish	Finnish	Norwegian
Groundwood		‡$60.00/$95.00*	*$80.00/$85.00*	$80.00/ —	
Kraft, Bleached ...	140.00/147.50	145.00/150.00	$140.00/142.50§		$142.50/ —
Semi-bleached, Kraft	130.00/135.00	130.00/135.00	$130.00/135.00§	130.00/135.00*	
Kraft, Unbl.	95.00/105.00	100.00/125.00	*105.00/110.00*	*105.00/135.00*	
Sulphite, Blchd. ...	140.00/ —	140.00/ —	$135.00/140.00*	140.00/ — *	$135.00/142.50*§
Sulphite, Unblchd. .	120.00/ —	120.00/ —	$115.00/122.00*	120.00/125.00*	
Sulphite, Unbl. Gl'sn.		124.00/ —	*124.00/ —		
Soda, Blchd.	140.00/ —	140.00/ —			

‡ F.o.b. Shipping Point. § On Dock Atlantic Ports. * Freight allowed.

RAG MARKET

New Domestic Cotton Cuttings
Delivered Mill Basis

	Per 100 lbs.
No. 1 White Shirts	$12.50/$13.00
No. 1 Unblchd. Muslins	14.50/ 15.00
Blchd. & Unblchd. Underwears ...	15.50/ 16.00
Blchd. Canton Flannels	11.00/ 11.50
No. 1 Light Silesias	7.50/ 8.00
No. 1 Light Prints	6.00/ 6.50
No. 1 Blue Overalls	7.25/ 7.75
Suntan Khakis	6.00/ 6.50
Fancy Shirts	6.50/ 7.00
Mixed Khakis	3.50/ 4.00
Cottonades	3.75/ 4.25
No. 1 Washables	3.50/ 3.75

Old Domestic Cotton Rags
(Prices to Dealers, F.o.b. Ship. Pt.)

	Per 100 lbs.
Mixed White	$2.75/$3.00
Cotton Pants & Overalls	2.00/ 2.25
Thirds and Blues, Repacked	1.65/ 1.75
No. 2 Roofing Rags	nominal

COTTON LINTERS

Memphis Market
F.o.b. Oilmills

	Mar. 23 Per 100 lbs
Grade 1 n.a.	
2	n.a. / $9.00
3 1st cut—felting	8.00/ 6.50
4	6.00/ 4.50
5	4.25/ 3.25
6 * 2nd cut—chemical	3.00/ 3.00
7	3.00/ 3.00

* Based on 73% cellulose.

Bagging

(Prices to Dealers, F.o.b. N. Y.)

	Per 100 lbs
Foreign Gunny	$4.00/$4.50
Foreign Scrap Burlap	3.00/ 3.75
Heavy Wool Tares	4.00/ 4.25
Austr. Wool Pouches	4.00/ 4.50
Domestic Manila Rope	6.50/ 7.00
Domestic No. 1 Sisal Strings	5.00/ 5.25

WASTE PAPER MARKET

Prices to mills, per ton, f.o.b. cars shipping point (includes brokers' fee.) These quotations are a partial indication of the price range or volume tonnage in each market on the date specified, as gathered from major dealers. SPECIAL PACKINGS AND SPOT TONNAGE NOT INCLUDED. Prices nominal. See TRENDS.

	New York March 29	Boston March 27	Chicago March 10	Los Angeles March 3
No. 1 Mixed Paper.....	$10.00/ 11.00	$10.00/ 11.00	$8.00/ —	$13.00/ —
No. 1 News	15.00/ 18.00	15.00/ 17.00	17.00/ —	13.00/ —
Overissue News	18.00/ 22.00	16.00/ 20.00	20.00/ 22.00	13.00/ —
Mill Wrappers	14.00/ 17.00	12.00/ 15.00	11.00/ —	11.00/ —
Old Corrugated Containers.....	16.00/ 18.00	15.00/ 16.00	20.00/ —	20.00/ —
No. 1 Sorted Br. Kraft Paper...	35.00/ 45.00	35.00/ 50.00	25.00/ —	25.00/ 35.00
New Double Kr. Ld. Corr. Cuts	40.00/ 47.50	40.00/ 47.50	45.00/ 47.50	45.00/ —
New 100% Kraft Corr. Cuts....	55.00/ 60.00	50.00/ 60.00	60.00/ —	45.00/ —
New Br. Kraft Env. Cuts.....	70.00/ 77.50	65.00/ 77.50	65.00/ —	40.00/ 45.00
New Br. Kraft Bag Waste.....	65.00/ 75.00	65.00/ 75.00	70.00/ —	35.00/ 45.00
No. 1 Groundwood Shvs.....	20.00/ 25.00	25.00/ 30.00	22.00/ —	27.00/ 34.00
White Newsblanks.....	60.00/ 65.00	50.00/ 60.00	40.00/ —	50.00/ 55.00
No. 1 Soft Wht. Shvs., coated..	65.00/ 70.00	70.00/ 80.00	60.00/ —	— / —
Hd. Wht. Shvs.....	102.00/110.00	95.00/110.00	100.00/ —	95.00/ —
Hd. Wht. Env. Cuts.....	120.00/130.00	110.00/125.00	105.00/ —	105.00/ —
Col. Tab. Cards.....	42.50/ 55.00	55.00/ 60.00	52.50/ 55.00	24.00/ —
Manila Tab. Cards, bales.....	75.00/ 85.00	80.00/ 85.00	75.00/ —	55.00/ —
No. 1 Col. Ledger.....	37.50/ 45.00	40.00/ 50.00	47.50/ 50.00	30.00/ —
White Ledger	57.50/ 65.00	60.00/ 65.00	65.00/ —	45.00/ —
Mixed Book & Mag.†.....	18.00/ 20.00	18.00/ 22.50	15.00/ —	— / —
No. 1 Rep'd. Hvy. Books‡.....	24.00/ 30.00	25.00/ 35.00	30.00/ —	— / —

† Includes Time & Life; no coarse groundwood. ‡ Not to exceed 10% groundwood. § Deld.

HEADQUARTERS FOR USED EQUIPMENT

FOR SALE

PUMPS

1—1¾" x 8" class KH Platt Iron Works vertical triplex pressure pump. Rated 2500 psi.
1—2½" x 10" class KH Platt Iron Works vertical triplex pressure pump. Rated 1500 psi.
1—8" x 20" Beloit triplex stuff pump.
1—8" x 18" Shartle Miami duplex stuff pump.
1—6" A-1 Shartle pump.
1—8" x 6" Shartle fan pump.

CALENDERS

1—9 Roll 152" face Farrel Calender stack.
1—7 Roll 144" face Black-Clawson Calender stack.
1—7 Roll 132" face Black-Clawson Calender stack.
1—5 Roll 96" face Farrel Calender stack.

SPECIAL

1—64" Seybold precision type trimmer model 12 ZF

CYLINDER MOLDS

1—60" dia x 152" face Cylinder mold
1—48" dia x 94" face Cylinder mold
3—36" dia x 126" face Cylinder mold

VALVES

3—16"—3 way Shartle motorized rotary valves
1—8"—3 way Shartle motorized rotary valve
3—8"—2 way Shartle motorized rotary valves
1—18"—Shartle slide valve, hand-wheel operated
4—10"—Shartle slide valves
2—10"—Shartle slide valves, hydraulic operated

BEATERS

1—70" x 48" E. D. Jones Steel tub breaker beater
1—60" x 60" Shartle C. I. tub breaker beater
5—62" x 54" Dilts Beaters, bandless rolls, C. I. tubs

BLACK-CLAWSON

SHARTLE BROS. MACHINE DIVISION
MIDDLETOWN, OHIO

A-2

PAPER TRADE JOURNAL CLEARING HOUSE PAPER TRADE JOURNAL

RATES FOR ADVERTISING (PAYABLE IN ADVANCE) — $.75 cents per line (6 words to line) minimum charge $3.75 —Additional charge of 70 cents if box number is used

Situation wanted advertisements can be repeated for ½ rate

Space in this section can also be purchased at $5.00 per column inch—(1" x 2¼)

Address replies to advertisements appearing under Box Number in care of PAPER TRADE JOURNAL, 15 West 47th Street, New York 36, N. Y.

HELP WANTED

CONFIDENTIAL EMPLOYMENT SERVICE

For paper and pulp mills and paper converting plants. Our service is rendered without charge to employers seeking executives. No charge to applicant until position is accepted. We invite your inquiries.

CHARLES P. RAYMOND SERVICE, Inc.
Phone: Liberty 2-6547
294 Washington St., Boston 8, Mass.
A-2

MANUFACTURER'S REPRESENTATIVES WANTED

We require additional sales representatives in various geographical areas to handle our gas and electric heaters which are widely used for industrial processing. Our sales set-up is being completely revamped and we invite letters from heating engineers or specialty selling groups now operating in fields of paper manufacturing and paper converting. Our equipment requires knowledge of convection and radiant heat. If your concern is rated A-1 in your area and is considerably above average in sales ability, please write us. This is an important, exclusive franchise and we invite commensurate letters. Sill Industries, Maplewood, New Jersey. A-2

PAPER EXPORT

Experienced Paper Exporter, Spanish Correspondent, Age 30-35 for old established Paper House. Submit Resumé and earnings record. Please reply Box 54-126 care Paper Trade Journal. A-2

TECHNICAL DIRECTOR
For new and expanding pulp mill

Chemical engineering graduate with at least ten years' experience in the manufacture of bleached kraft pulp and high grade white papers. Must have had enough experience in directing technical work in these fields to qualify him to assume full responsibility for the management of Technical Department. This would include the supervision of laboratory, quality and process control, process and product development.

All replies will be kept in strict confidence. Please make your resume as complete as possible and furnish recent photograph. Our employees know about this advertisement.

Address Box 54-94 care Paper Trade Journal. A-9

PERSONNEL SERVICE ASSOCIATES
115 State St., Springfield 3, Mass.
Tel. 6-4749

Confidential Placement Service for the Pulp, Paper and Converting industries. Administrative—Production—Sales—Technical. Attractive positions and competent men always listed. Inquiries welcome. A-2

SALES REPRESENTATIVE: Experienced in selling Resin Coated and Printed Paper. Knowledge of specialty bags helpful. Age 30 to 45. Progressive company—opportunity for advancement. Salary open—liberal management benefits. Send complete resume with recent snapshot to Box 53-423 care Paper Trade Journal. TF

HELP WANTED

TOUR BOSS
BOSS MACHINE TENDER

For eastern mill on groundwood printing grades; fourdrinier machines only. Excellent opportunity, salary, working conditions. Reply should include all qualifications and experience. Box 54-111, care Paper Trade Journal. A-9

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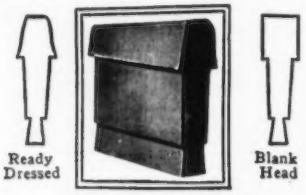

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100	West.		900	Syn.
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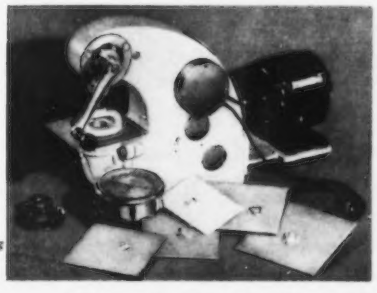

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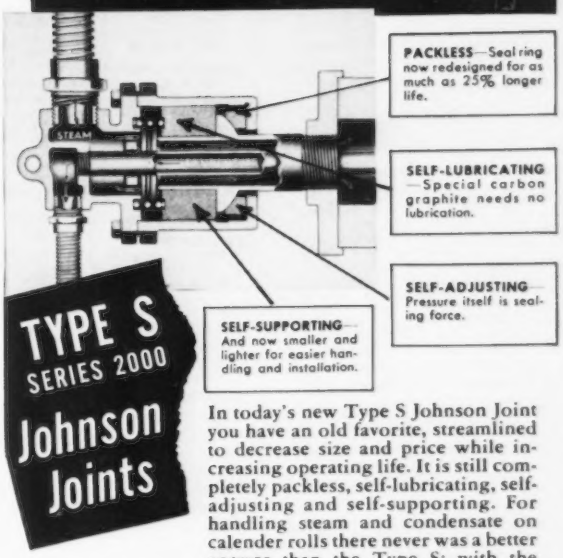
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The Goodyear Tire & Rubber Company

HUMECTANTS
Aktivin Division, Heyden Chemical Corp.
Arnold, Hoffman & Co., Inc.
Nopco Chemical Co.
Wyandotte Chemicals Corp., Michigan Alkali Div.

HYDRAULIC OSCILLATING SHOWERS
Ronningen-Petter Co.

HYDRAULIC TURBINES & ACCESSORIES
James Leffel Co.

IMPREGNANTS
American Cyanamid Company, Industrial Chemicals Division
Sun Oil Company
B. F. Goodrich Chemical Co.

INDENTING MACHINES
Dilts Machine Works

INDUSTRIAL CONTROL
Westinghouse Electric Corp.

INDUSTRIAL TIRES
B. F. Goodrich Co.

INDUSTRIAL TRACTORS
Towmotor Corp.

INKOMETER
Thwing-Albert Instrument Co.

INSTRUMENTS, TESTING AND MEASURING
Black-Clawson Co.
General Electric Co.
W. & L. E. Gurley
B. F. Perkins & Son
Taylor Instrument Cos.

Testing Machines, Inc.
Thwing-Albert Instrument Co.
Tracerlab, Inc.
Westinghouse Electric Corp.

INSULATION
Insul-Mastic Corp. of America

JACKETS
Emerson Mfg. Co.

JOINTS
The Bagley & Sewall Company
Beloit Iron Works
Cram Associates
Downingtown Mfg. Co.
Johnson Corp.
Moore & White Co.
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

JORDAN BARS
Ronningen-Petter Co.

JORDANS
Emerson Mfg. Co.
Ronningen-Petter Co.
Shartle Brothers Machine Co.

JORDAN FILLINGS
Appleton Machine Co.
Bahr Bros. Manufacturing Co.
John W. Bolton & Sons, Inc.
E. D. Jones & Sons Co.
Ronningen-Petter Co.
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Valley Iron Works Co.

KILNS
Jackson & Church Co.
F. L. Smidth & Co.

KNIVES
Black Clawson Company
John W. Bolton & Sons, Inc.
Dilts Machine Works, Inc.
Hamblet Machine Co.
E. D. Jones & Sons Co.
The Moore & White Co.
Shartle Brothers Machine Co.
Simonds Saw & Steel Co.
Taylor Stiles & Co.
Valley Iron Works Co.

KNOTTERS
Black Clawson Company
Improved Machinery, Inc.
Sandy Hill Iron & Brass Works

LABORATORY CORRUGATOR
Testing Machines, Inc.
Thwing-Albert Instrument Co.

LABORATORY EQUIPMENT
Appleton Machine Co.
Bauer Brothers Co.
Bird Machine Company
Dilts Machine Works
Downingtown Mfg. Co.
W. & L. E. Gurley
Egan, Frank W., & Co.
Hermann Mfg. Co.
Jackson & Church Co.
E. D. Jones & Sons Co.
Ronningen-Petter Co.
Shartle Brothers Machine Co.
Taylor Instrument Companies
Testing Machines, Inc.
Thwing-Albert Instrument Co.
Valley Iron Works Co.
Waldron, John, Corp.

LAMINATING MACHINES
The Bagley & Sewall Company
Dilts Machine Works
Egan, Frank W., & Co.
Hudson Sharp Machine Co.
Paper Converting Machine Co.
Potdevin Machine Co.
Waldron, John, Corp.

LAY BOYS
Dilts Machine Works
Gibbs-Brower Company, Inc.
Hamblet Machine Co.
Moore & White Co.

LINTER PULP
Hercules Powder Co., Inc.

LUBRICANTS
Cities Service Oil Co.
Gulf Oil Corp.
Houghton & Co.
Sinclair Refining Co.
Socony-Vacuum Oil Co.
The Texas Company

MACHINERY, CARBON PAPER
Haida Engineering Co.

MAGAZINE REELS
Dilts Machine Works

MAGNETIC SEPARATORS
Bauer Bros. Co.
Shartle Brothers Machine Co.

MATERIALS HANDLING
Dilts Machine Works
Downingtown Mfg. Co.
Jeffery Mfg. Co.
Link Belt Co.
Shartle Bros. Mch. Co.
Towmotor Corp.
The Wellman Engrg. Co.

MICROMETERS & CALIPERS
Farrel-Birmingham Co.
Lobdell Co.
Testing Machines, Inc.

MIXERS
Jackson & Church Co.
Mixing Equipment Co.
Walker Process Equipment, Inc.

MICRO-CRYSTALLINE WAXES
Sun Oil Company

MOISTURE CONTENT CONTROL
Testing Machines, Inc.
Vapo Systems Co.

MOISTURE METERS
Testing Machines, Inc.

MOTORS
Allis Chalmers Mfg. Co.
Elliott Company
Moorhead Elec. Machy. Co.

MOTORS AND GENERATORS
Elliott Company, Inc.
General Electric Company
Moorhead Elec. Machy. Co.
Reliance Electric & Engrg. Co.
Westinghouse Electric Corp.

NICKEL AND NICKEL ALLOYS
The International Nickel Co.

PACKING BOXES
Johnson Corporation
The Moore & White Co.
Shartle Brothers Machine Co.

PAPER CONDITIONERS
Vapo Systems Co.

PAPER MACHINE DRIVES
The Bagley & Sewall Company
Beloit Iron Works
Black-Clawson Co.
Dowington Mfg. Co.
Manchester Machine Co.
Moore & White Co.
Sandy Hill Iron & Brass Works
Westinghouse Electric Corp.

PAPER MACHINES
The Bagley & Sewall Company
Beloit Iron Works
Black-Clawson Company
Downingtown Mfg. Co.
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
Lukenweld
Manchester Machine Co.
Moore & White Co.
Pusey & Jones Corp.
I. J. Ross Company
Ross Paper Machinery Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.

PAPER MACHINE SLICES
Black-Clawson Company
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
The Moore & White Co.
The Sandy Hill Iron & Brass Works
Valley Iron Works Co.

PAPER MILL MACHINERY
Ronningen-Petter Co.

PAPER TUBE MACHINERY
Dietz Machine Works
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
Hudson Sharp Machine Co.
Langston Co., Samuel M.
Paper Converting Machine Co.

PARAFFINE WAXES
Sun Oil Company

PARAFFIN WAX EMULSIONS
American Cyanamid Co., Ind. Chem. Div.
Arnold, Hoffman & Co., Inc.
Hercules Powder Co., Inc.
Nopco Chemical Co.

PASTING MACHINES
Beloit Iron Works
Black-Clawson Company
Dilts Machine Works
Frank W. Egan & Co.
Gibbs-Brower Company, Inc.
Murray, D. J., Mfg. Co.
Moore & White Co.
Potdevin Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Waldron Corp., John

PEBBLE MILLS
F. L. Smidth & Co.

pH METERS
Testing Machines, Inc.
Thwing-Albert Instrument Co.

PHOTO GRAVURE ROLLS
Stone, Thos. & Geo. M., Inc.

PIPE
Aluminum Co. of America
Armco Drainage & Metal Products, Inc.
Babcox & Wilcox Co.
Crane Company
Grinnell Company
National Tube Co.
Walworth Company

PIPE FABRICATORS
Pittsburgh Piping & Equipt. Co.
Ronningen-Petter Co.

PIPE FITTINGS
Aluminum Co. of America
Armco Drainage & Metal Products, Inc.
Crane Company
Grinnell Company
Pittsburgh Piping & Equipt. Co.
Walworth Co.

PIPING, HIGH PRESSURE
Pittsburgh Piping & Equipt. Co.

PIPING (Pilowold Lines)
Goodyear Tire & Rubber Co.

PITCH CONTROL
American Cyanamid Company, Industrial Chemicals Division
Antara Chemicals Division, General Dyestuff Corp.
Monsanto Chemical Company
National Aluminate Corp.
Nopco Chemical Co.
Rohm & Haas Company

PLASTICIZERS
American Cyanamid Company Industrial Chemicals Company
Aktivin Division, Heyden Chemical Corp.
Arnold, Hoffman & Co., Inc.
B. F. Goodrich Chemical Co.
Jackson & Church Co.
Naugatuck Chemical Division of U. S. Rubber Co.
Nopco Chemical Co.
Rohm & Haas Company

PLATERS
Gibbs-Brower Company, Inc.
Perkins & Son, Inc., B. F.

PLATES
Armco Steel Corp.
Babcock & Wilcox Co.
Lukenweld Division
Lukens Steel Company
L. O. Ross Engrg. Corp.
Timken Roller Bearing Co.

PLUGS
The Appleton Machine Co.
Black Clawson Company
Emerson Mfg. Co.
E. D. Jones & Sons Co.
Shartle Brothers Machine Co.

POPE TYPE REELS
Black-Clawson Company
Downingtown Mfg. Co.
Egan, Frank W., & Co.
Manchester Machine Co.
Moore & White Co.
Sandy Hill Iron & Brass Works

PRESERVATIVES
Antara Chemicals Division, General Dyestuff Corp.
E. I. du Pont de Nemours & Co.

PRESS ROLLS
Beloit Iron Works
Black-Clawson Co.
Downingtown Mfg. Co.
Goodrich, B. F., Company, Inc.
Manchester Machine Co.
Moore & White Co.
Sandy Hill Iron & Brass Works
Stowe-Woodward Inc.

PRESSURE FILTERS
Holyoke Machine Co.
Hungerford & Terry, Inc.
Jackson & Church Co.
Ronningen-Petter Co.
Sandy Hill Iron & Brass Works

PRESSURE VESSELS
Chicago Bridge & Iron Co.
Mahon, R. C., Co.
A. O. Smith Corp.

PRESSES
Beloit Iron Works
Black-Clawson Company
Downingtown Mfg. Co.
Dietz Machine Works
Farrel-Birmingham Co.
Gibbs-Brower Company, Inc.
Heinrich, H. H., Co.
Hudson-Sharp Machine Co.
Jackson & Church Co.
Manchester Machine Co.
The Moore & White Co.
Paper Converting Machine Co.
Potdevin Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Testing Machines, Inc.
Valley Iron Works Co.
Waldron Corp., John
H. G. Weber & Co., Inc.

PRINTING ROLLS
Stone, Thos. & Geo. M., Inc.

PROTECTIVE COATINGS
Insul-Mastic Corp. of America

PULLEYS
Bird Machine Company
Black-Clawson Co.
Dodge Mfg. Corp.
Horton Mfg. Co., Inc.
Sandy Hill Iron & Brass Works

PULP CLASSIFIER
The Bauer Bros. Co.
Testing Machines, Inc.
Thwing-Albert Instrument Co.

PULP CLEANERS
Bauer Bros. Co.
Bird Machine Co.
Nichols Engrg. & Research Corp.
Sandy Hill Iron & Brass Works
Shartle Bros. Machine Co.

PULP REFINERS
Emerson Mfg. Co.
Shartle Bros. Machine Co.

PULP SCREENS
Bird Machine Co.
Murray, D. J., Mfg. Co.
Sandy Hill Iron & Brass Works
Shartle Bros. Machine Co.

PULP STOCK VALVES
Crane Company
Grinnell Company
Murray, D. J., Mfg. Co.
Record Fdy. & Mach. Co.
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

PULP WASHERS
Mundt, Chas. & Sons
Sandy Hill Iron & Brass Works
Shartle Bros. Machine Co.

PULPERS
Apmew, Inc.
Bauer Brothers Co.
Cowles Company
Curlator Corp.
Dilts Machine Works
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Midwest Fulton Mch. Co.
Morden Machines Co.
Shartle Brothers Machine Co.

PULPS
Brown Company
Gottesman & Co., Inc.
Lyddon & Co. (America), Inc.
Parsons & Whittemore, Inc.
Perkins-Goodwin Co.
Price & Pierce, Ltd.
Pulp and Paper Trading Co.
Restigouche Co., Ltd.

PULPSTONES
Norton Company

PULP TESTERS
Testing Machines, Inc.

PULP TREATING
Curlator Corp.

PULVERIZING MILLS
Jeffery Mfg. Co.
F. L. Smidth & Co.

PUMP VALVE BALLS
Stowe-Woodward Inc.

PUMPS
Allis Chalmers Mfg. Co.
Apmew, Inc.
The Bagley & Sewall Company
Beloit Iron Works
Black Clawson Company
Buffalo Pumps, Inc.
DeLaval Steam Turbine Co
Downingtown Mfg. Co.
Gibbs-Brower Company, Inc.
Johnson Corp.
Moore & White Co.
Nash Engineering Co.
Read Standard Corp.
Ronningen-Petter Co.
Roots Connerswille Blower Corp.
I. J. Ross Company
Ross Paper Machy. Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.

RADIANT BURNERS
Red-Ray Mfg. Co., Inc.

RAG COOKING PROCESSES
General Dyestuff Corp.
Rohm & Haas Company

RAG CUTTERS
Gibbs-Brower Company, Inc.
B. F. Perkins & Son, Inc.
Taylor-Stiles & Co.

RECOVERY SYSTEMS
Babcock & Wilson Co.
Chicago Bridge & Iron Co.
Moore & White Co.
D. J. Murray Mfg. Co.
Peabody Engrg. Corp.
Pusey & Jones Corp
Ross Engineering Corp., J. O.
Valley Iron Works Co.
Vulcan Copper & Supply Co.

REELS
The Appleton Machine Co.
The Bagley & Sewall Company
Beloit Iron Works
Black Clawson Company
Dilts Machine Works (Kohler Systems)
Egan, Frank W., & Co.
Downingtown Mfg. Co.
Hudson-Sharp Mch. Co.
Manchester Machine Co.
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
The Smith & Winchester Mfg. Co.
Waldron, John, Corp.

REFINERS
Appleton Machine Co.
Bahr Brothers Mfg. Co.
Bauer Brothers Co.
Curlator Corp.
Dilts Machine Works
Downingtown Mfg. Co.
Gibbs-Brower Company, Inc.
Hermann Mfg. Co.
Jackson & Church Co.
E. D. Jones & Sons Co.
Morden Machines Co.
Murray, D. J., Mfg. Co.
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Sutherland Refiner Corp.
Valley Iron Works

REFRACTORIES
Harbison-Walker Refractories Co.

REGULATORS
Airmatic Valve, Inc.
Apmew, Inc.
Bird Machine Company
General Electric Co.
Improved Machinery Inc.
Johnson Corp.
Poirier Control Company
Shartle Brothers Machine Co.
Taylor Instrument Companies
Westinghouse Electric Corp.

RESINS
American Cyanamid Company, Plastics & Resins Division
Borden Company
The Dow Chemical Company
B. F. Goodrich Chemical Co.
The Goodyear Tire & Rubber Company
Hercules Powder Co.
Koppers Company, Inc.
Monsanto Chemical Company
Naugatuck Chemical Division of U. S. Rubber Co.
Nopco Chemical Co.
Pennsylvania Indust. Chem. Corp.
Rohm & Haas Company

ROLLS
Appleton Machine Co.
The Bagley & Sewall Company
Beloit Iron Works
Black Clawson Company
Dilts Machine Works
Downingtown Mfg. Co.
Frank W. Egan & Co.
Emerson Mfg. Co.
Farrel-Birmingham Co.
Gibbs-Brower Company, Inc.
B. F. Goodrich Co.
Holyoke Machine Co.
Lindsay Wire Weaving Co.
Lobdell United Co.
Manchester Machine Co.
The Moore & White Co.
D. J. Murray Mfg. Co.
Perkins, B. F., & Sons Co.
Pusey & Jones Corp.
J. J. Ross Company
Ross Paper Machy. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.
Stone, Thos. & Geo. M., Inc.
Stowe-Woodward Inc.
Tyer Rubber Co.
U. S. Rubber Co.
Valley Iron Works Co.
Waldron Corp., John

ROLL COVERS
The Goodyear Tire & Rubber Company
Stowe-Woodward Inc.
Tyer Rubber Co.

ROLL HANDLING EQUIPMENT
Dilts Machine Works

ROLL STANDS
Cameron Machine Co.
Dilts Machine Works
Frank W. Egan & Co.
Moore & White Co.
The Sandy Hill Iron & Brass Works
John Waldron Corp.
H. G. Weber & Co., Inc.

ROPE CARRIERS
Black Clawson Co.
Downingtown Mfg. Co.
The Moore & White Co.
The Sandy Hill Iron & Brass Works

ROTARY KILNS
F. L. Smidth & Co.

ROTARY SCREENS
Bird Machine Company

ROTARY STEAM JOINTS
Johnson Corp.
The Moore & White Co.
Sandy Hill Iron & Brass Works
Shartle Bros. Mch. Co.

RUBBER COVERED ROLLS
Stowe-Woodward Inc.
Tyer Rubber Co.

RUBBER PRODUCTS
B. F. Goodrich Co.
The Goodyear Tire & Rubber Company
Stowe-Woodward Inc.
Tyer Rubber Co.

SAMPLE CUTTER
Testing Machines, Inc.
Thwing-Albert Instrument Co.

SATURANTS
B. F. Goodrich Chemical Co.

SATURATING MACHINES
Dilts Machine Works
Frank W. Egan & Co.
Gibbs-Brower Company, Inc.
Moore & White Co.
Potdevin Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Waldron Corp., John
Weber, Herman G.

SAVEALLS
Bird Machine Company
Bulkley, Dunton Processes, Inc.
Chicago Bridge & Iron Co.
Improved Paper Machinery Corp.
Moore & White Co.
Ronningen-Petter Co.
Shartle Bros. Machine Co.
Walker Process Equipment, Inc.

SAWS
Simonds Saw & Steel Co.
Moore & White Co.

SCALES
Merrick Scale Mfg. Co.
Testing Machines, Inc.

SCREEN PLATES
Bird Machine Company
Fitchburg Screen Plate Co.
Magnus Metal Corp.
Morey Paper Mill Supply Co.
Testing Machines, Inc.

SCREENS
Appleton Wire Works
Appleton Machine Company
The Bagley & Sewall Company
Bird Machine Company
Carthage Machine Co.
Dilts Machine Works, Inc.
Downingtown Mfg. Co.
Gibbs-Brower Company, Inc.
E. D. Jones & Sons Co.
Moore & White Co.
Murray, D. J., Mfg. Co.
J. J. Ross Company
Ross Paper Machy. Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Valley Iron Works Co.

SCREENS, CHIP (Vibrating)
Link Belt Co.

SCREENS (Rotary)
Bird Machine Company

SHAKES
Black Clawson Company
Downingtown Mfg. Co.

SHAKE STICKS
Westinghouse Electric Corp.

SHEET MACHINES
Downingtown Mfg. Co.
Gibbs-Brower Company, Inc.
Thomas W. Hall Co.
Hermann Mfg. Co.
Hudson Sharp Machine Co.
Ronningen-Petter Co.
Testing Machines, Inc.
Valley Iron Works Co.

SHOWER PIPES
Bird Machine Company
Black-Clawson Company
Downingtown Mfg. Co.
Emerson Mfg. Co.
Moore & White Co.
Ronningen-Petter Co.
Sandy Hill Iron & Brass Works
Sandusky Fdy. & Mch. Co.
Shartle Brothers Machine Co.
Smith & Winchester Mfg. Co.

SHREDDERS
Bauer Brothers Co.
Carthage Machine Co.
Gibbs-Brower Company, Inc.
Jackson & Church Co.
Jeffrey Mfg. Co.
Taylor, Stiles & Co.

SIZE PRESSES
Black-Clawson Co.
Downingtown Mfg. Co.
Manchester Machine Co.
Moore & White Co.
Sandy Hill Iron & Brass Works

SIZING
American Bitumuls & Asphalt Co.
American Cyanamid Company, Industrial Chemicals Division
The Dow Chemical Company
du Pont, E. I., de Nemours & Co.
Glidden Company
Hercules Powder Co.
The Hubinger Co.
Monsanto Chemical Company
National Aluminate Corp.
Nopco Chemical Co.
Wyandotte Chemicals Corp., Michigan Alkali Div.

SIZING TESTER
W. & L. E. Gurley
Testing Machines, Inc.
Thwing-Albert Instrument Co.

SLIME CONTROL
Antara Chemicals Division, General Dyestuff Corp.
The Dow Chemical Company
E. I. du Pont de Nemours & Co.
Monsanto Chemical Co.
National Aluminate Corp.
Rohm & Haas Company
Vanderbilt Co., R. T.
Wyandotte Chemicals Corp., Michigan Alkali Div.

SLITTERS
The Bagley & Sewall Company
Black-Clawson Company
Cameron Machine Co.
Carthage Machine Co.
Dietz Machine Works
Dilts Machine Works
Downingtown Mfg. Co.
Frank W. Egan & Co.
Gibbs-Brower Company, Inc.
Thomas W. Hall Co., Inc.
Hamblet Machine Co.
Hudson-Sharp Mch. Co.
Improved Machinery Inc.
Langston Co., Samuel M.
Moore & White Co.
D. J. Murray Mfg. Co.
Paper Converting Machine Co.
J. J. Ross Company
Ross Paper Machy. Co.
The Sandy Hill Iron & Brass Works
Smith & Winchester Mfg. Co.
Valley Iron Works Co.
Waldron Corp., John

SMOKE STACKS
Chicago Bridge & Iron Co.

SOFTNESS-STIFFNESS TESTER
W. & L. E. Gurley
Testing Machines, Inc.
Thwing-Albert Instrument Co.

SOLUBLE OILS
American Cyanamid Company, Industrial Chemicals Division
Antara Chemicals Division, General Dyestuff Corp.
Arnold, Hoffman & Co., Inc.
Nopco Chemical Co.

SOLVENTS
Pennsylvania Ind. Chem. Co.

SPECIAL MACHINERY
Black Clawson Company
Dilts Machine Works
Downingtown Mfg. Co.
Egan, Frank W., & Co.
Jackson & Church Co.
Mahon, R. C., Co.
Manchester Machine Co.
Moore & White Co.
Murray, D. J., Mfg. Co.
Paper Converting Machine Co.
Potdevin Machine Co.
The Sandy Hill Iron & Brass Works
Shartle Bros. Machine Co.
Waldron, John, Corp.

SPEED REDUCERS
Dodge Manufacturing Corp.
Downingtown Mfg. Co.
Link Belt Co.
Westinghouse Elec. Corp.

SPLICING TISSUE
Williams-Gray Co.

STAINLESS AND ALLOY CASTINGS
Michigan Steel Casting Co.

STAINLESS STEEL
Armco Steel Corp.
Crucible Steel Co.
U. S. Steel Corp.

STARCH
Clinton Foods, Inc.
Corn Products Sales Co.
The Hubinger Co.
National Starch Products, Inc.

STEAM JET EJECTORS
Elliott Company, Inc.

STEAM JOINTS
The Moore & White Co.
Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

STEAM SPECIALTIES
Babcock & Wilcox Co.
Johnson Corp.

STEEL
Armco Steel Corp.
Carnegie Illinois Steel Co.
Crucible Steel Co.
Lukens Steel Company
D. J. Murray Mfg. Co.
The Sandy Hill Iron & Brass Works
U. S. Steel Corp.

STEEL, CLAD
Babcock & Wilcox Co.
Lukens Steel Company

STEEL TANKS
Chicago Bridge & Iron Co.
Jackson & Church Co.
Mahon, R. C., Co.
Ronningen-Petter Co.
The Sandy Hill Iron & Brass Works
Shartle Bros. Machine Co.

STOKERS
Westinghouse Elec. Corp.

STRAINER SCREENS
Ronningen-Petter Co.

STRAINERS
Elliott Company, Inc.
Ronningen-Petter Co.

STRETCH TESTER
Testing Machines, Inc.
Thwing-Albert Instrument Co.

STUFF CHESTS
Downingtown Mfg. Co.
E. D. Jones & Sons Co.
Moore & White Co.
Shartle Brothers Machine Co.
Valley Iron Works Co.

STUFF BOXES
Kalamazoo Sheet Metal Mfg. Co.

SUCTION BOX COVERS
Appleton Wood Products
Emerson Mfg. Co.
Moore & White Co.
Westinghouse Electric Corp.

SUCTION BOXES
Beloit Iron Works
Black-Clawson Company
Downingtown Mfg. Co.
E. D. Jones & Son Co.
Manchester Machine Co.
Moore & White Co.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.

SUCTION ROLLS
Beloit Iron Works
Downingtown Mfg. Co.
Manchester Machine Co.

SULPHUR
Texas Gulf Sulphur Co.

SULPHUR BURNERS
Valley Iron Works Co.

SULPHUR DIOXIDE
Virginia Smelting Co.

SUPERCALENDERS
The Appleton Machine Co.
B. F. Perkins & Son, Inc.

SWITCHGEAR
Westinghouse Elec. Corp.

SYNTHETIC LATICES
American Cyanamid Company, Industrial Chemicals Division
B. F. Goodrich Chemical Co.
The Goodyear Tire & Rubber Company
Naugatuck Chemical Division of U. S. Rubber Co.
Nopco Chemical Co.

SYNTHETIC RESINS
American Cyanamid Co., Ind. Chem. Div.
Hercules Powder Co., Inc.
Pennsylvania Ind. Chem. Co.
Rohm & Haas Company

SYPHONS
Poirier Control Company
Shartle Bros. Machine Co.

TAILING SCREENS
Sandy Hill Iron & Brass Works

TAKE OFF UNITS
Dilts Machine Works

TALC
American Cyanamid Company, Industrial Chemicals Division
Vanderbilt Co., R. T.

TANKS
Chicago Bridge & Iron Co.
Graver Tank Mfg. Co.
Kalamazoo Sheet Metal Mfg. Co.
Mahon, R. C., Co.
B. F. Perkins & Sons, Inc.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co.
Stebbins Engrg. Co.

TEARING TESTERS
Thwing-Albert Instrument Co.
Testing Machines, Inc.

TENSILE TESTERS
B. F. Perkins & Son, Inc.
Testing Machines, Inc.
Thwing-Albert Instrument Co.

THICKENERS, DECKERS AND SAVEALLS
The Appleton Machine Co.
Bird Machine Company
Carthage Machine Co.
Chicago Bridge & Iron Co.
Dilts Machine Works
Downingtown Mfg. Co.
Improved Machinery Inc.
Moore & White Co.
D. J. Murray Mfg. Co.
Ross Paper Machinery Corp.
The Sandy Hill Iron & Brass Works
Shartle Brothers Machine Co
Valley Iron Works Co.
Walker Process Equipment, Inc.

TITANIUM
E. I. du Pont de Nemours & Co.
Titanium Pigment Co.
R. T. Vanderbilt Co.

TOOLS
Walworth Company

TRACTORS AND TRUCKS
Towmotor Corp.

TRANSFORMERS
Moorhead Elec. Machy. Co.
Westinghouse Elec. Corp.

TRANSMISSIONS
Dodge Mfg. Corp.
Jeffrey Mfg. Co.
Link Belt Co.

TRAPS
Crane Co.
Grinnell Company
Johnson Corporation
Shartle Brothers Machine Co.

TUBE CLEANERS
Elliott Company, Inc.

TUBE MILLS
F. L. Smidth & Co.

TUBES
Aluminum Co. of America
Babcock & Wilcox Co.
Crucible Steel Co.
National Tube Co.

TUBING MACHINES
Dilts Machine Works

TUBING, MECHANICAL
National Tube Co.

TURBINES
De Laval Turbine Co.
Elliott Company, Inc.
General Electric Company
James Leffel Co.
Westinghouse Electric Corp.

UNWINDERS
Dilts Machine Works
Downingtown Mfg. Co.
Egan, Frank W., & Co.
Moore & White Co.
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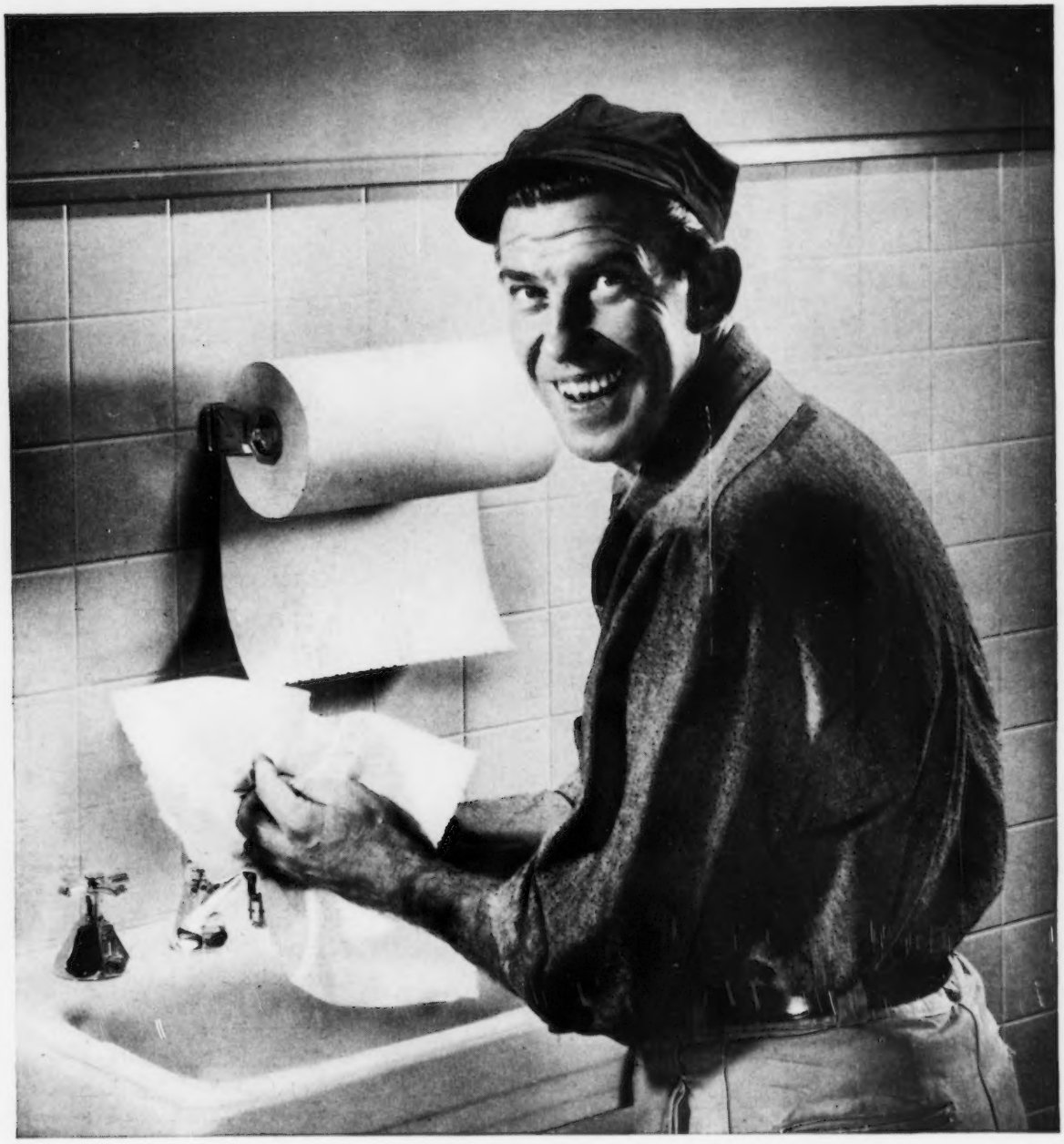

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